World Petroleum

NOVEMBER
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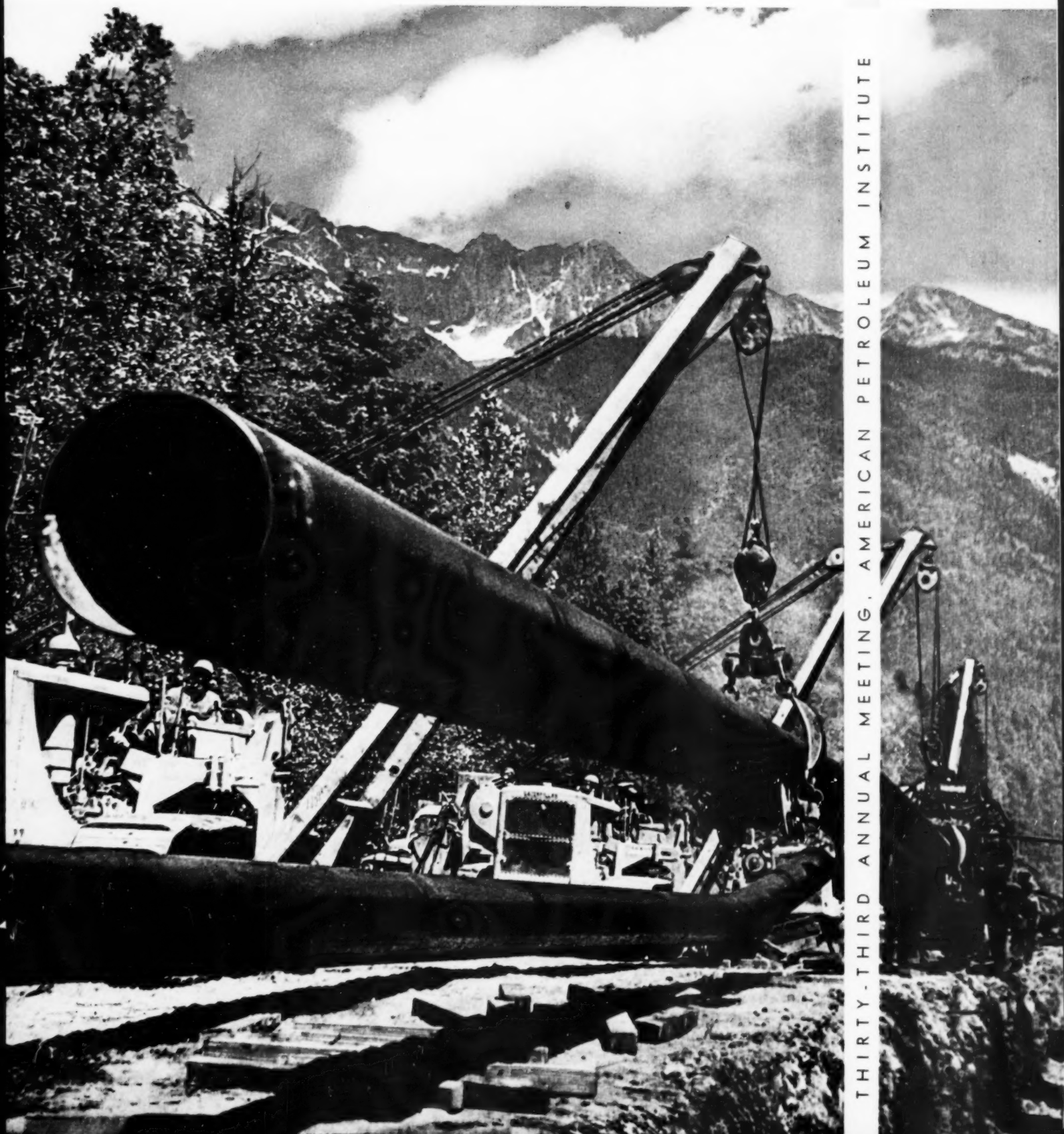
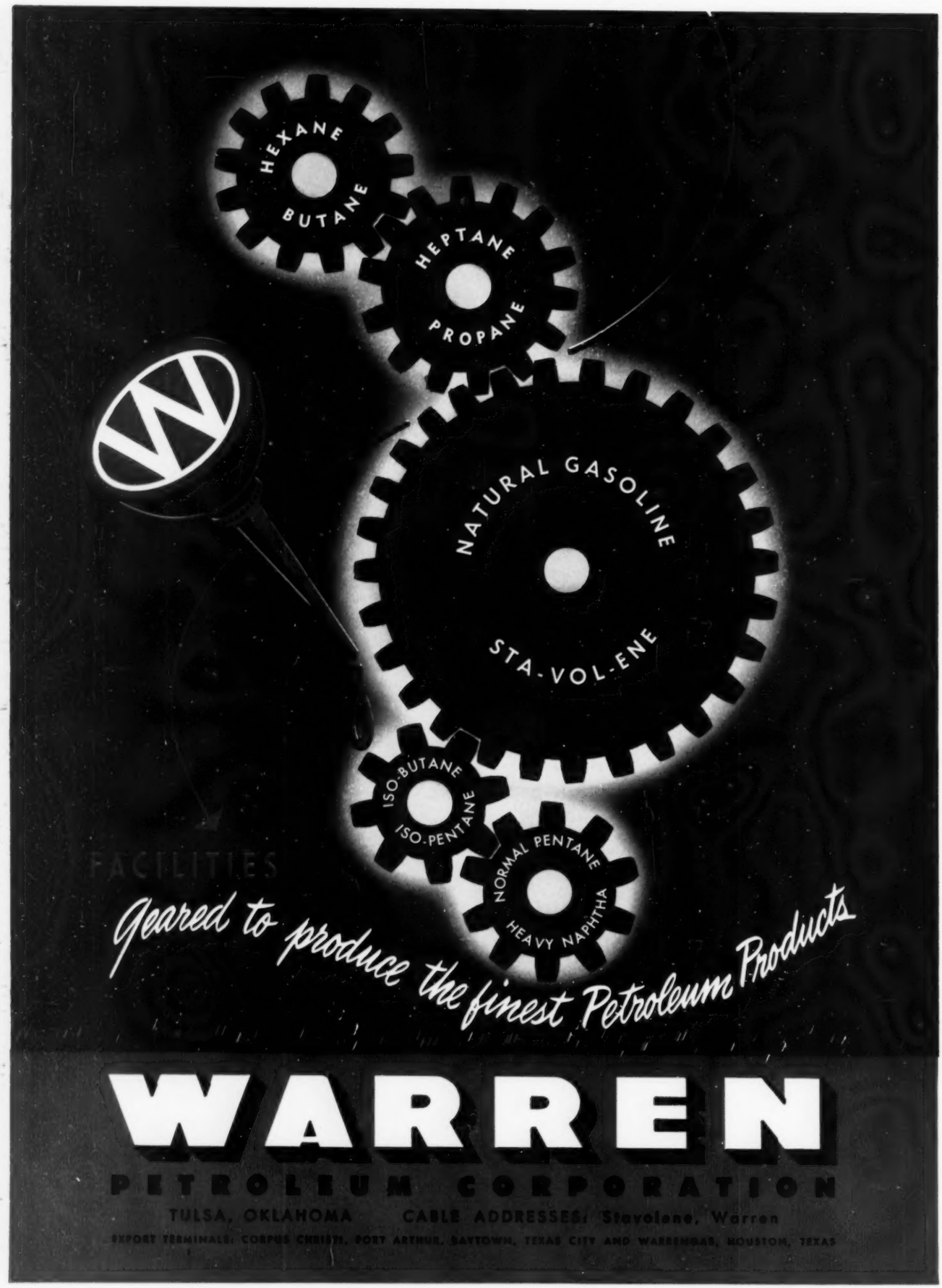
one dollar per copy



THIRTY-THIRD ANNUAL MEETING, AMERICAN PETROLEUM INSTITUTE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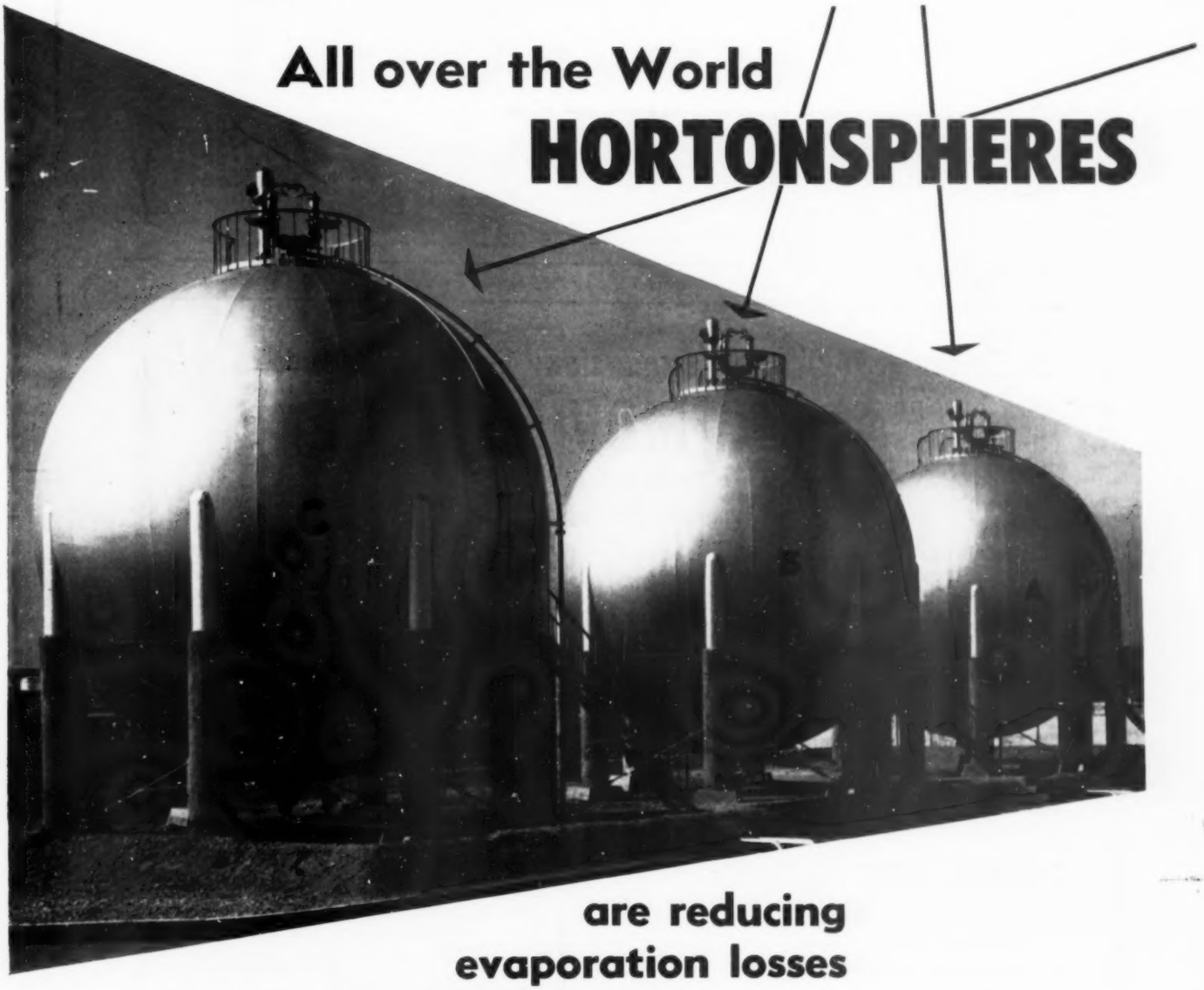
All over the World HORTONSPHERES



are reducing evaporation losses of volatile hydrocarbons

There can be no loss unless the vents open. This principle, as applied to Hortonspheres, is answering a world-wide problem of successfully storing volatile hydrocarbons. Hortonspheres are designed especially to withstand internal pressure and throughout the petroleum industry are proving every day to be the most efficient method of storing butane, butane-propane mixtures, and volatile refinery stocks.

A Hortonsphere will not allow any of its contents to escape as long as the internal pressure does not exceed the setting of the pressure relief valves. It is dependable too . . . with the exception of the pressure relief valves there are no moving parts. Maintenance costs are reduced to a minimum with inspection and painting only being required.

Hortonspheres are available in capacities up to 30,000 bbls. for pressures up to 217 lbs. per sq. in. in the smaller capacities. Write our nearest office for information, estimates or quotations.

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Horton Floating Roofs	Plain Hortonspheroids
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Latest News About New Tools, Techniques and Services

McCullough Explosive-Expansion Type "B" Bridge Plug

HAS NO MOVING PARTS

Assures a Positive Seal on all Permanent or Temporary Plugging Operations

The McCullough Type "B" Bridge Plug is the only one-piece, all metal, drillable, explosive-expansion bridge plug available. It saves setting time, assures a positive metal-to-metal seal, drills out easier and can take the roughest treatment.

WORLD'S SMALLEST ELECTRIC WIRE LINE BRIDGE PLUGS—Newest additions to the Type "B" Bridge Plug line are a complete range of small sizes for tubing and drill pipe, starting with 1¾" O.D. for 2" tubing and up. These small electric wire line plugs have all the features and advantages of the larger sizes and have been tested to 13,000 p.s.i. differential hydrostatic pressure.

COMPARE THESE FEATURES:

- ★ No moving or hardened parts.
- ★ Drills out easier and faster.
- ★ Shorter in length; smaller in O.D.
- ★ Save rig time in running, locating and setting.
- ★ Resists corrosion and electrolysis.
- ★ Takes roughest treatment without setting prematurely.
- ★ Assures a positive seal under heavy hydrostatic and mechanical loads.
- ★ Plugs in open hole in hard formations.
- ★ Full range of sizes from 1¼" O.D. for 2" tubing, for all sizes of tubing, drill pipe, casing and open hole up to and including 10½" O.D. for 11¾" casing.

COMPARE THESE RESULTS:

1. A McCullough Type "B" Bridge Plug was set in 6⅝" O.D., 20 lb. casing at 2400 feet. No cement was used above the plug. The well was perforated and while running tubing, thirty-eight joints of 3" pipe were dropped forty feet. THE TYPE "B" PLUG DID NOT MOVE. After the tubing was recovered, a hookwall test was run and found the Type "B" Plug WAS NOT LEAKING.

2. A Type "B" Bridge Plug was set in open hole. The full weight of 6400 feet of 4½" drill pipe was set on top of the plug. The Type "B" Plug held the full weight of the pipe without slipping.

3. One major operator drilled out a Type "B" Bridge Plug in one hour with a used rock bit. Another, using a rock bit, reports thirty minutes drilling out time. The average time required is usually from three to five hours, depending on the driller, equipment, etc.

4. Here is an unusual job, 5½", 15 lb. casing was set at 5250 feet. The well was to be produced from the open hole below the casing shoe. Production tests resulted in a large volume of water from the bottom of the hole. To obtain a water shut-off, 45 gallons of cement were dumped at the desired point and a 4½" O.D. Type "B" Plug was set in the fresh cement at 5284 feet. The entire operation was successful, forming a permanent, leak proof job.

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. . . Or write for free four-page, technical folder, #101, describing the new McCullough Type "B" Bridge Plug in detail. Do it today!

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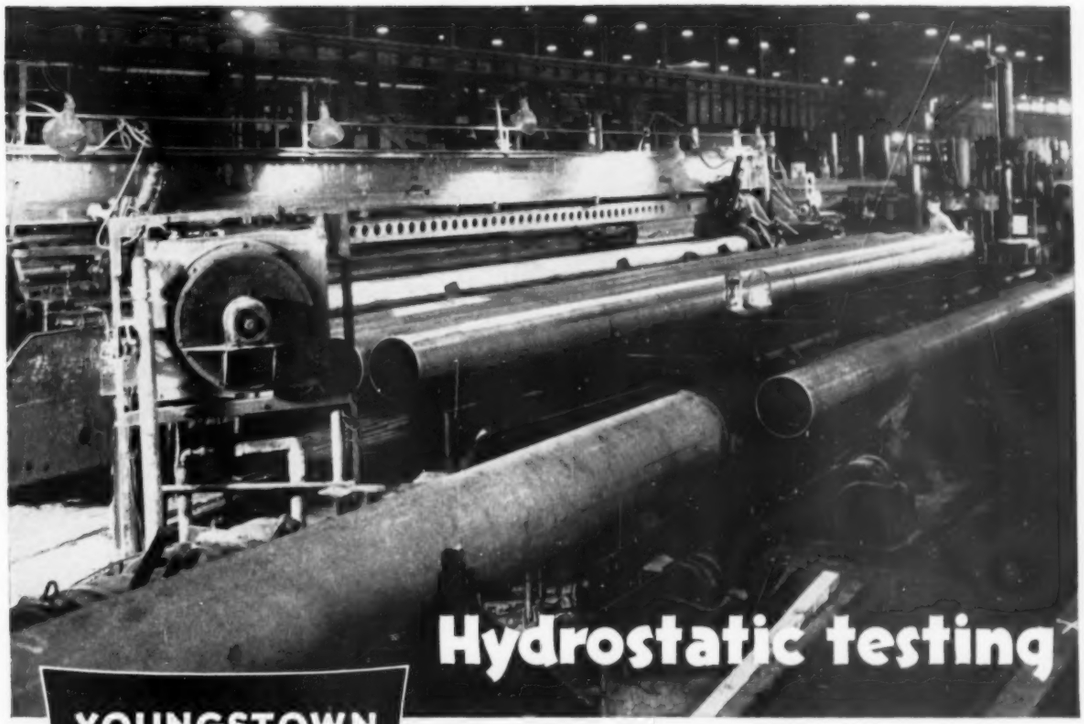

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Electric Weld
LINE PIPE
Uniformly satisfactory in service because—

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2. Weldability is outstanding
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4. Line up characteristics are excellent

PROVES EVERY LENGTH

●As a final check on its soundness, every length of Youngstown Electric Weld Pipe undergoes this hydrostatic test. Filled with water under high pressure, the pipe is struck repeatedly along the weld zone with pneumatic hammers. Only perfect pipe can survive such rigorous testing.

Youngstown Electric Weld Pipe for the oil and gas industry is being made in sizes up to 22" OD and in grades as high as X52. For further information, phone or write our nearest District Sales Office.

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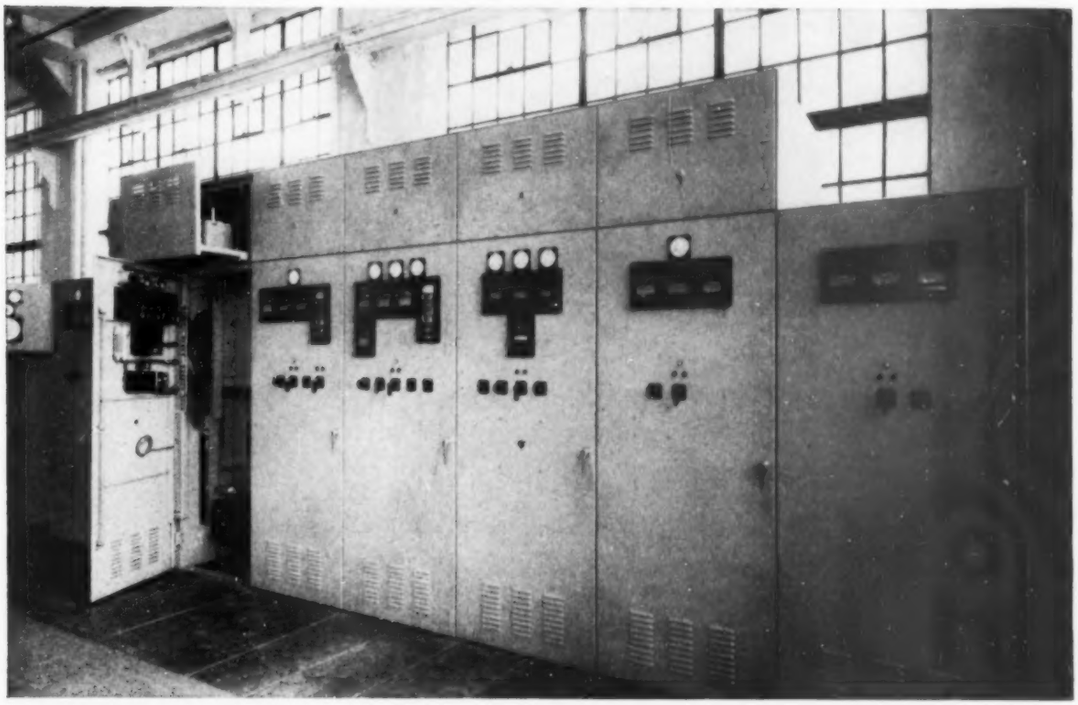

G-E Metal-Clad Switchgear Insures STRENGTH AND SAFETY!

MORE RIGID—SAFE, EASY ACCESS! Each metal-clad compartment is *all-welded*, reinforced, no bolts or rivets in frame. Solid-unit construction means greater rigidity. Control panel *hinged* for safe, easy access. Nothing to come loose. Compartment is warp-protected, too!

SIMPLE OPERATION AND INSPECTION!

New magne-blast circuit breaker has maximum number of parts interchangeable among differently-rated breakers. Easily removable breaker has operating mechanism and control relay on front, faster-acting elevating mechanism, visible primary contacts in disconnect position. Meters and relays easily removed for testing or replacing.

PROTECTION!

Improved G-E metal-clad switchgear give you the greatest protection against electrical shutdowns. Circuit breaker is insulated with new flame retardant material. Bus compartments totally enclosed.

BETTER VENTILATION!

All circuit components are completely ventilated with natural-draft system. Assures proper ventilation throughout equipment.

PLUS...

Easier-to-read, long-scale instruments . . . effortless raising, lowering breaker . . . simplified contact design . . . and many other new and advanced features that mean safety and efficiency in handling power. 1A-55-08

★ ***See your G-E representative for the facts on G-E power distribution. Or write International General Electric Co., "Switchgear Specialist", 570 Lexington Ave., New York 22, N.Y., U.S.A.*** ★

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The legendary giant Paul Bunyan was a midget – compared to this man. For today's lumberman has more power than his famous forerunner ever had . . . he has *oil* working for him. Petroleum helps him cut, load, haul . . . helps him produce over 37-billion board feet of lumber per year. From our forests come our homes and furniture . . . pencils and paper . . . thousands of other necessities. The Texas Company has long been a leading supplier of petroleum to America's lumber industry.

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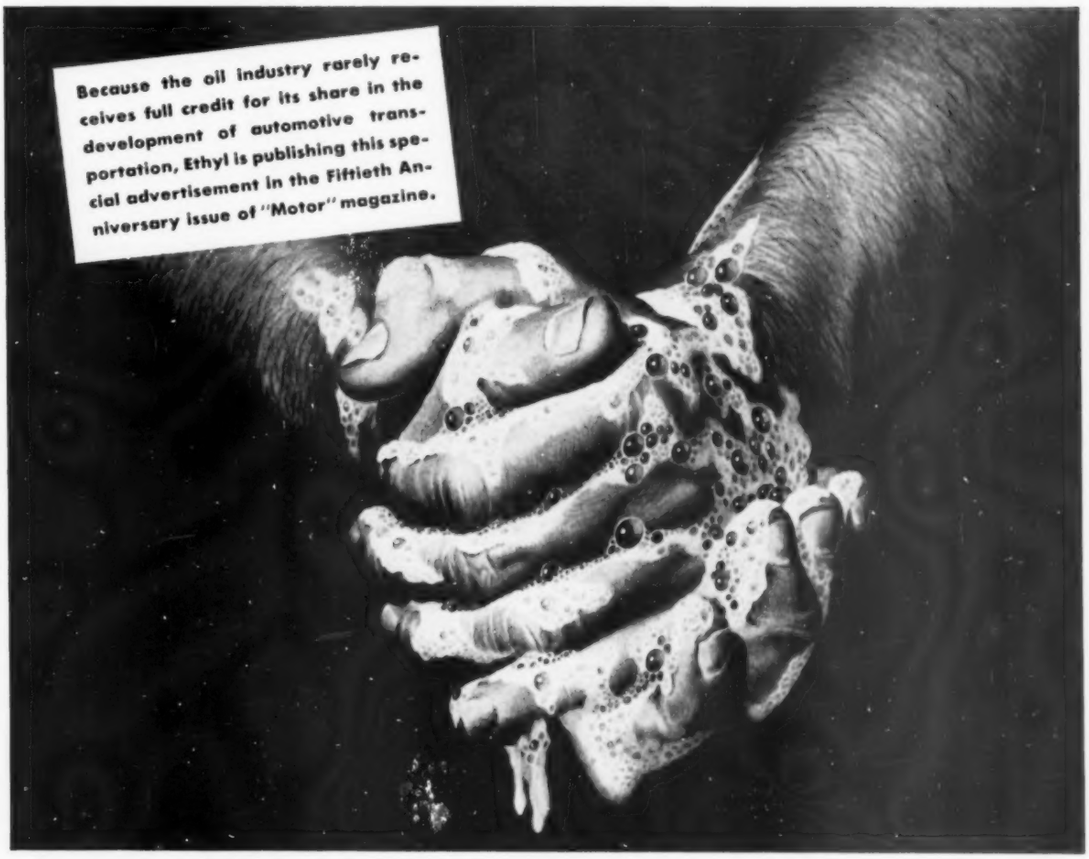
Because the oil industry rarely receives full credit for its share in the development of automotive transportation, Ethyl is publishing this special advertisement in the Fiftieth Anniversary issue of "Motor" magazine.

Why is automotive progress like a man washing his hands?

Did you ever try to wash *one* hand? You know it's all but impossible. As the old saying goes, "One hand washes the other."

Improving transportation is also a two-handed affair. One "hand" is the automotive industry. The other is the petroleum industry. Again and again, progress in one has been made practical by a complementary development in the other.

For example, it was the proved ability of the oil industry to provide high octane fuels, through improved refining methods and the use of "Ethyl" antiknock compounds, that prepared the way for higher compression engines. And to prove that it works both ways, the engineering genius of the automobile industry took full advantage of better gasolines to produce more and more efficient engines.

Ethyl people, recognizing this interdependence between engines and fuels, have made it the keynote of Ethyl's research and cooperative projects for the past 30 years.

We hesitate to predict what future progress will bring, but one thing is certain—that this progress will be the result of two of America's greatest industries working hand in hand. And Ethyl research people will continue to work with both industries and to serve in a very special way as liaison between them on problems of fuels and engines.

ETHYL CORPORATION, New York 17, N. Y.

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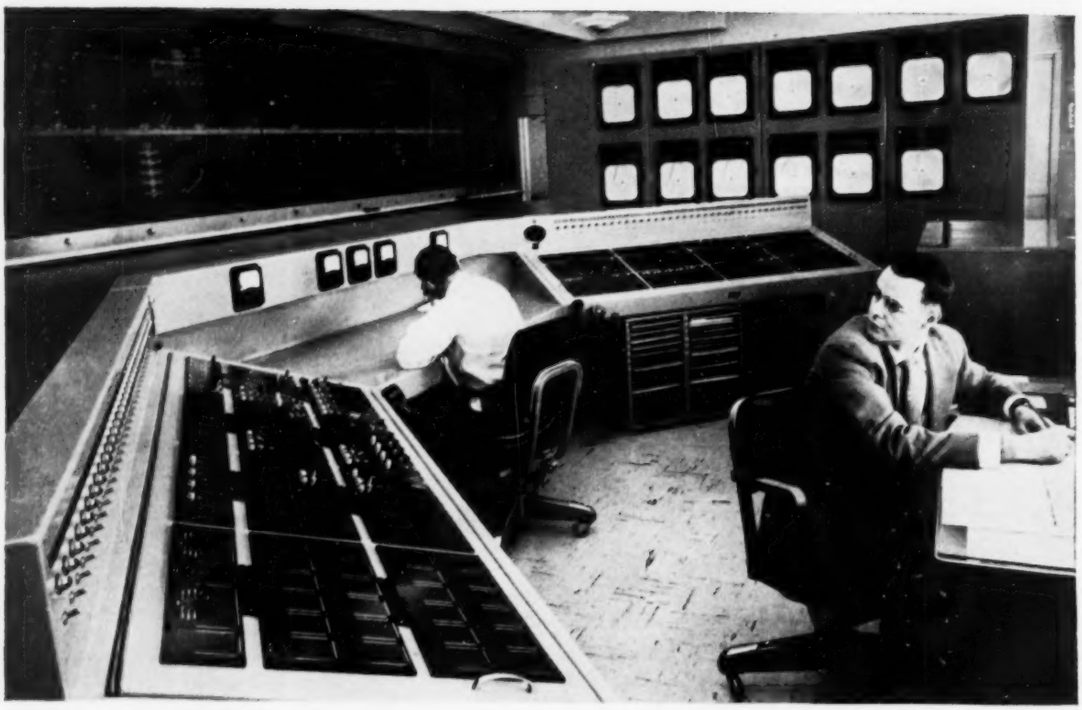

1000 MILES AT A GLANCE

You are looking at the Platte Pipeline Company's communications system. 1000 Miles of super-efficient microwave, surveyed, designed, manufactured and installed by *Philco* . . . world's leading manufacturer of microwave equipment.

The entire 1000 miles of this new microwave communications and control system can be seen in a glance at this terminal control board in Kansas City, Missouri. All functions of the pipeline can be observed and controlled at this point . . . The operation of pumps and compressors, the pressures and flow rates of oil, telegraphic printers, VHF mobile and stationary radio, even the operation of the microwave system itself.

Philco microwave provides complete communications and control for this giant pipeline with greater reliability and less maintenance cost than could be obtained from any other type of system.

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Washington PIPE LINE

By Joseph Huttlinger

A new Tidelands battle is shaping up for the U. S. Supreme Court. It will give **Earl Warren,** the new Chief Justice, a chance to disqualify himself, or vote for state title and the present bill. One vote could be decisive. **Dean Acheson** and **Thomas G. Corcoran,** New Deal attorneys, are attacking this year's law, which split offshore lands between states and federal government. The U. S. is defending the law. Arkansas, Alabama, Missouri and Rhode Island are bringing the cases. Oil men, however, are going blithely ahead with their leasing plans. That seems to make sense. Odds are the present law will stick. If not, present leases will be confirmed.

Taxes: There are rumblings of a new attack on the **depletion allowance** of 27.5 percent. They may get louder. Chances are they won't change anything. The allowance itself, written into law, seems safe. The Treasury Department is studying the matter, will give its views in January. The Congress then legislates. Whatever the Treasury stand, the Congress is strong for the 27.5 percent. Thus, oil men are keeping an alert eye, but counting on the present tax provision remaining on the books. **Personal income taxes** go down automatically by 10 per cent on January 1. **Excess profits taxes** go out on January 1. **Gasoline excise taxes** of two cents a gallon are scheduled to drop to 1.5 cents by April 1. Bets are, however, the cut will be blocked.

Giant-Inch Crude Oil Pipe Line: Defense planners are talking up a huge line from the **Texas Gulf Coast to the East Coast.** A 36-inch diameter line is mentioned. Industry is talking down the line—Dr. Robert E. Wilson, Standard Oil Co. (Ind.); Eugene Holman, Standard Oil Co. (N.J.); P. C. Spencer, Sinclair Oil Corp., and others. They say a new line is not needed, is not economical. Better to build tankers against the needs of any new war. Further, the little-inch line of the last war, now in natural gas service, could be turned back to oil, says R. H. Hargrove, president of Texas Eastern Transmission Co. Hargrove also operates the wartime big-inch line, but says this is needed for gas, war or peace. The guesses are that industry will come out on top, but it will take months to be sure. Avenues of **compromise** include a smaller products line from Beaumont, Texas, to Cincinnati and Newark.

Surplus of Oil: It's here, at the refinery, in crude oil, in oil imports. But it's being worked off. Some refiners want government to sponsor a **voluntary cut-back** agreement, but they won't get it. Senator Frank Carlson, R., Kans., is the latest to ask the White House to help cut back oil imports. This group won't get help. This is a hands-off government, for one thing. And the White House leans toward free imports.

PAD: The **last round** is here. Come the end of this year, no more Petroleum Administration for Defense. An Oil and Gas Division of the Interior Department will take its place. The powers would be limited.

NPC: The National Petroleum Council **will continue** as advisory group to Interior. Secretary of Interior Douglas McKay praises it and industry likes it despite some carping. NPC's present job: to find out what industry wants to succeed PAD. The report is due from B. Brewster Jennings, Socony-Vacuum Oil Co., at the end of the year.

Antitrust: The cartel suit is a candidate for **out-of-court settlement.** But it may take time yet. New oil antitrust suits are under study, but Attorney General Herbert Brownell, Jr., is taking his time. Probably will say no to most of them.

Iran: It looks like **months if not years** before a major shakeout. That's the official, private view. **Herbert Hoover, Jr.,** petroleum consultant to Secretary of State John Foster Dulles, is on a fact-finding trip to Iran. So, oil men are planning without Persian oil for the near future.

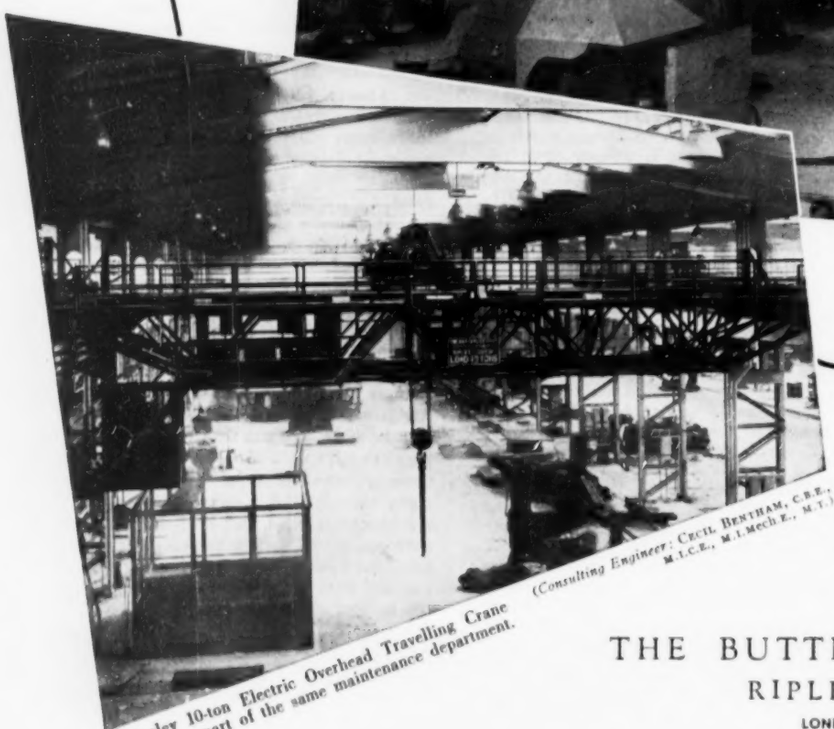
Personnel: Thomas P. Pike, president Pike Drilling Co., Los Angeles, is the new deputy assistant secretary of defense for supply and logistics. **E. H. Weaver,** manager of purchases of the Union Oil Co. of California, has joined the Office of Defense Mobilization as assistant director for materials. **Marion W. Boyer** has resigned after three years as general manager for the Atomic Energy Commission to return to Standard Oil Co. (N.J.). **David H. West,** on leave from Standard Oil Co. (N.J.), is the new assistant deputy administrator for foreign operations of PAD. **Franz von Schilling, Jr.,** on leave from California-Texas Oil Co., Ltd., has been named director of the PAD's foreign supply and transportation division. **Philip M. Dean,** on leave from Standard Oil Co. (N.J.), has been named assistant director of the foreign refining division.

Oil in War: This is always on deck. It's the reason for PAD. And plans about war are the biggest, if least-known, job of the agency. What, then, is the outlook in the last months of PAD? All is secret, but there are impressions. They may be more accurate than hard figures. **Demand may reach 10 million b/d** in any war. It could be more or less, depending. Present U. S. demand is eight million barrels daily. Supply for the war machine, and allies, will be met. **Rationing** could save one to two million barrels daily from civilian use. No more. Refineries could get more gasoline and fuel oil by more cracking. Expect this. Oil to coal **conversions** would follow for hotels, apartments, commercial buildings, maybe for some homes because of less residuals. More capacity in pipe lines would be laid from Canada to the U. S., probably from the Texas Gulf Coast to the East Coast, perhaps from West Texas to California. Abroad, too. Drilling should be held up to present level—48,000 new wells a year.

ELECTRIC OVERHEAD TRAVELLING CRANES

by BUTTERLEY

30 ton Butterley Electric Overhead Travelling Crane recently installed in the maintenance department of an important steel works.



Butterley 10-ton Electric Overhead Travelling Crane in another part of the same maintenance department.

(*Consulting Engineer:* CECIL BENTHAM, C.B.E., M.I.C.E., M.I.Mech.E., M.I.)

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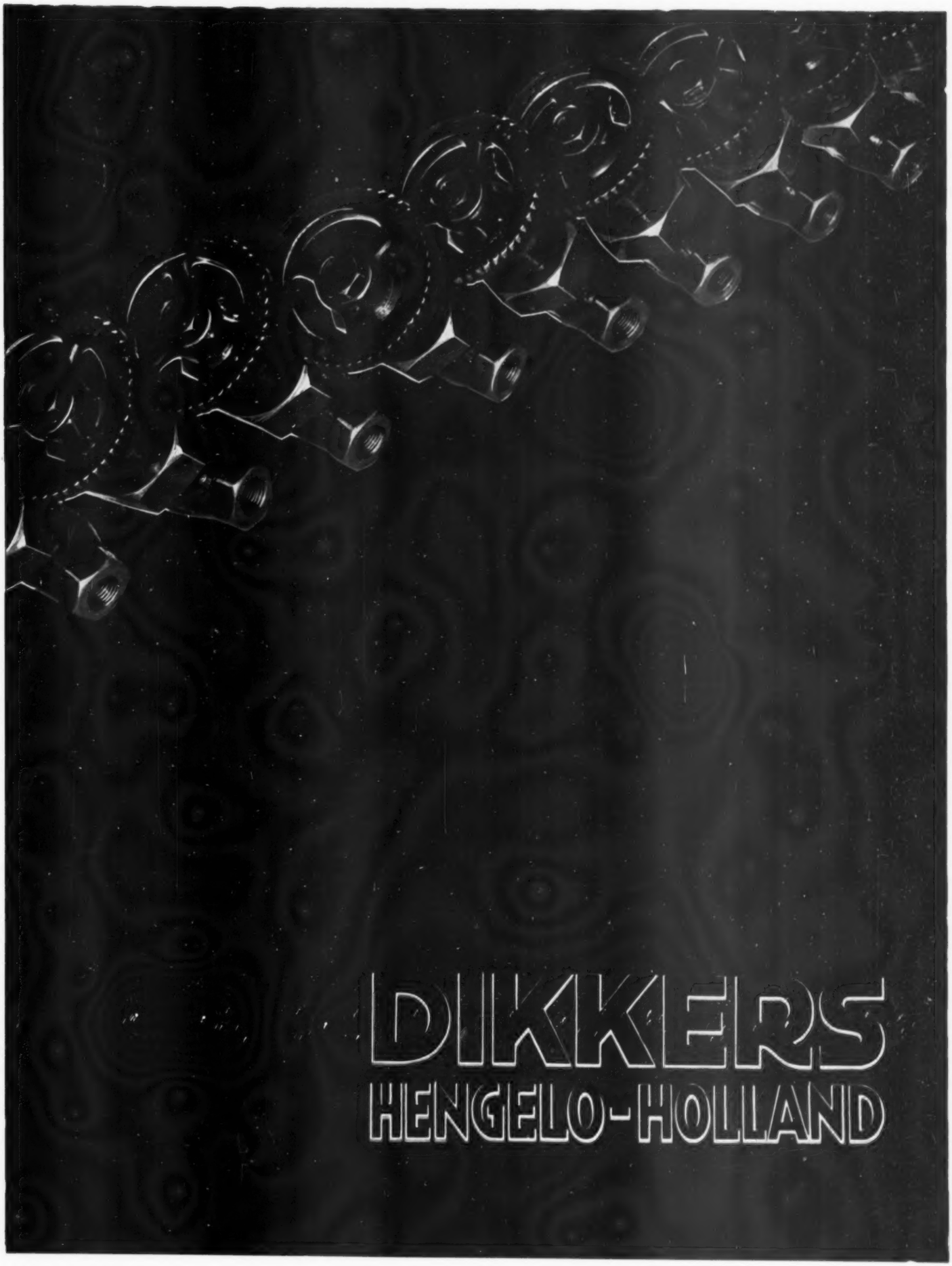
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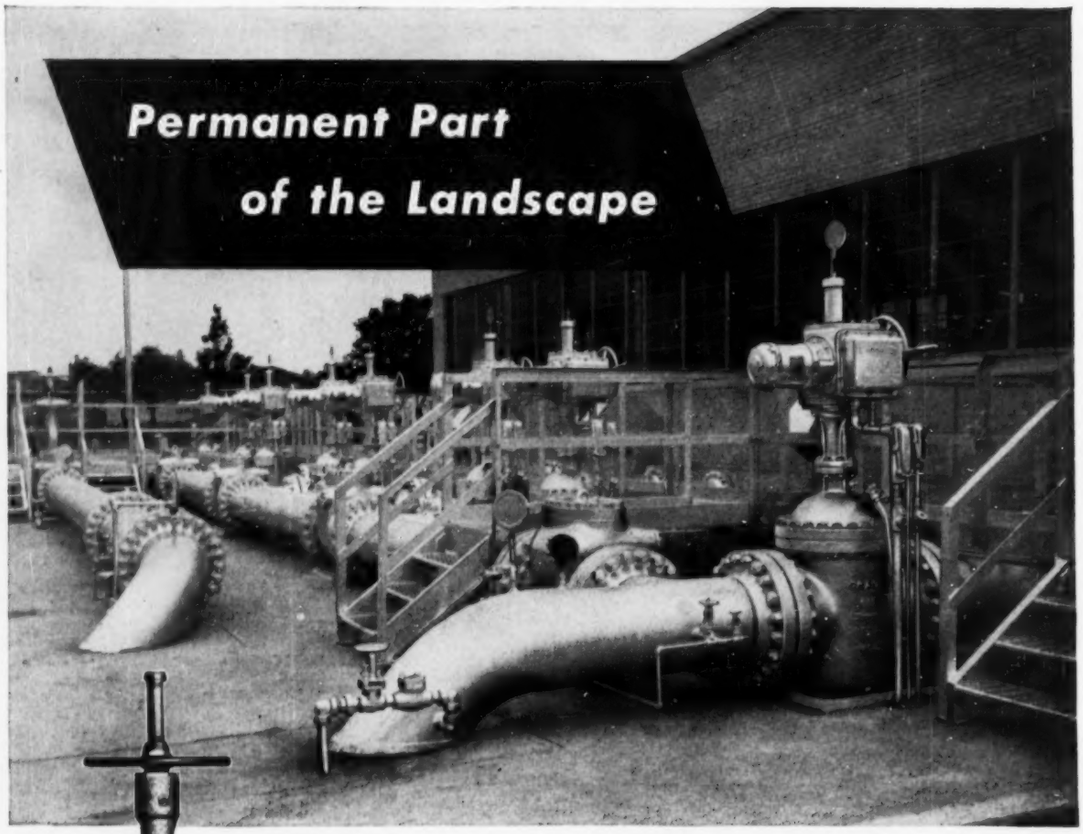

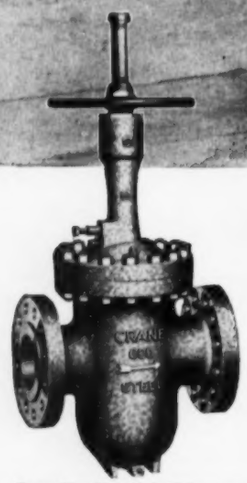

Crane Pipe Line Gate Valves are made in Full-Way or Venturi patterns for working pressures up to 1440 pounds, oil or gas. Sizes 2 to 30 inch.

Dependable CRANE pipe line valves

CLASS 600 GATES

As new pipe lines are laid, more and more Crane Pipe Line Valves go in . . . to become a permanent part of the landscape.

The reason for the popularity of Crane Pipe Line Gates is their outstanding dependability. Even infrequent operation won't affect their efficiency. That's because all working parts are sealed in grease to assure smooth operation and positive closure of the dual-seating double disc. There's no problem of erosion either, since disc is fully seated in open position as well as closed position. Special plasti-packing forms a tight and durable stem seal.

And to assure smooth, clear flow with minimum pressure drop, Crane designed the conduit-type disc ports to coincide exactly with the seat openings. There are no pockets to catch dirt or cause turbulence. Read all about this pipe line favorite in your Crane 53 Catalog and in Circular AD-1864 available from your Crane representative, or write direct.

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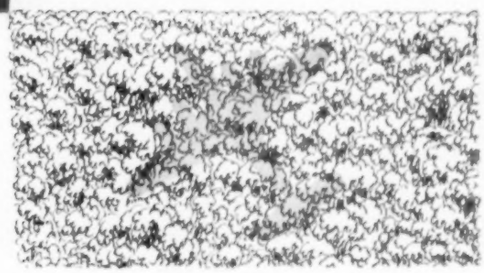
From Tokyo to Karachi; from the minerally rich highlands of Southern Africa to the coastal cities of Australia and New Zealand, the varied petroleum products of Standard-Vacuum weave in some way through the whole pattern of living.



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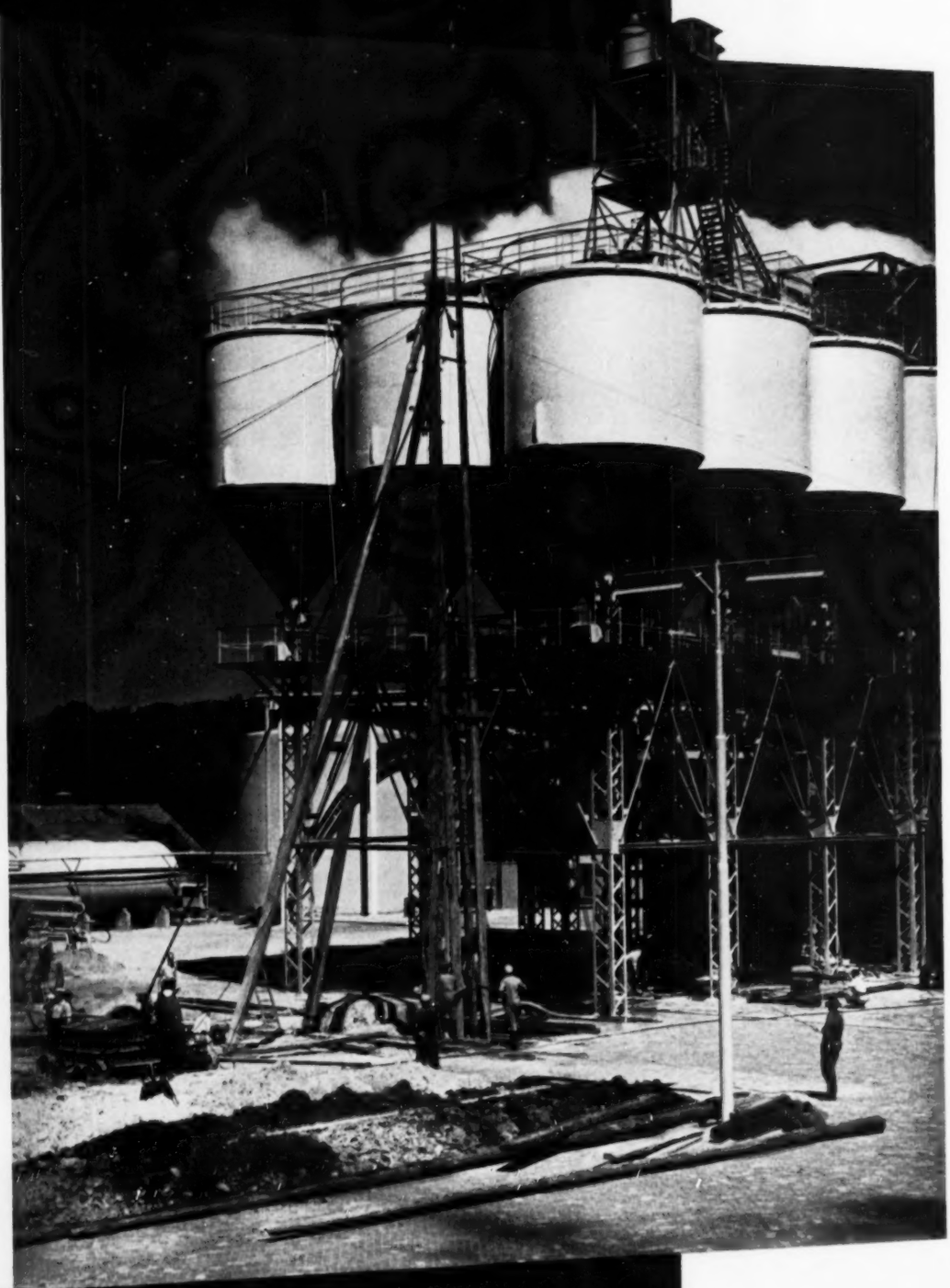
KETJENCAT

M.S. FLUID CRACKING CATALYST

based on the processes of AMERICAN CYANAMID COMPANY New York



Enlargement of the plant capacity enables us to meet the increasing demand

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Throughout the world . . . wherever you plan to explore . . . you can rely on Rogers' equipment, techniques and experience. And speaking of experience, Rogers' crews have more than 500 man-years of world-wide service in petroleum exploration.

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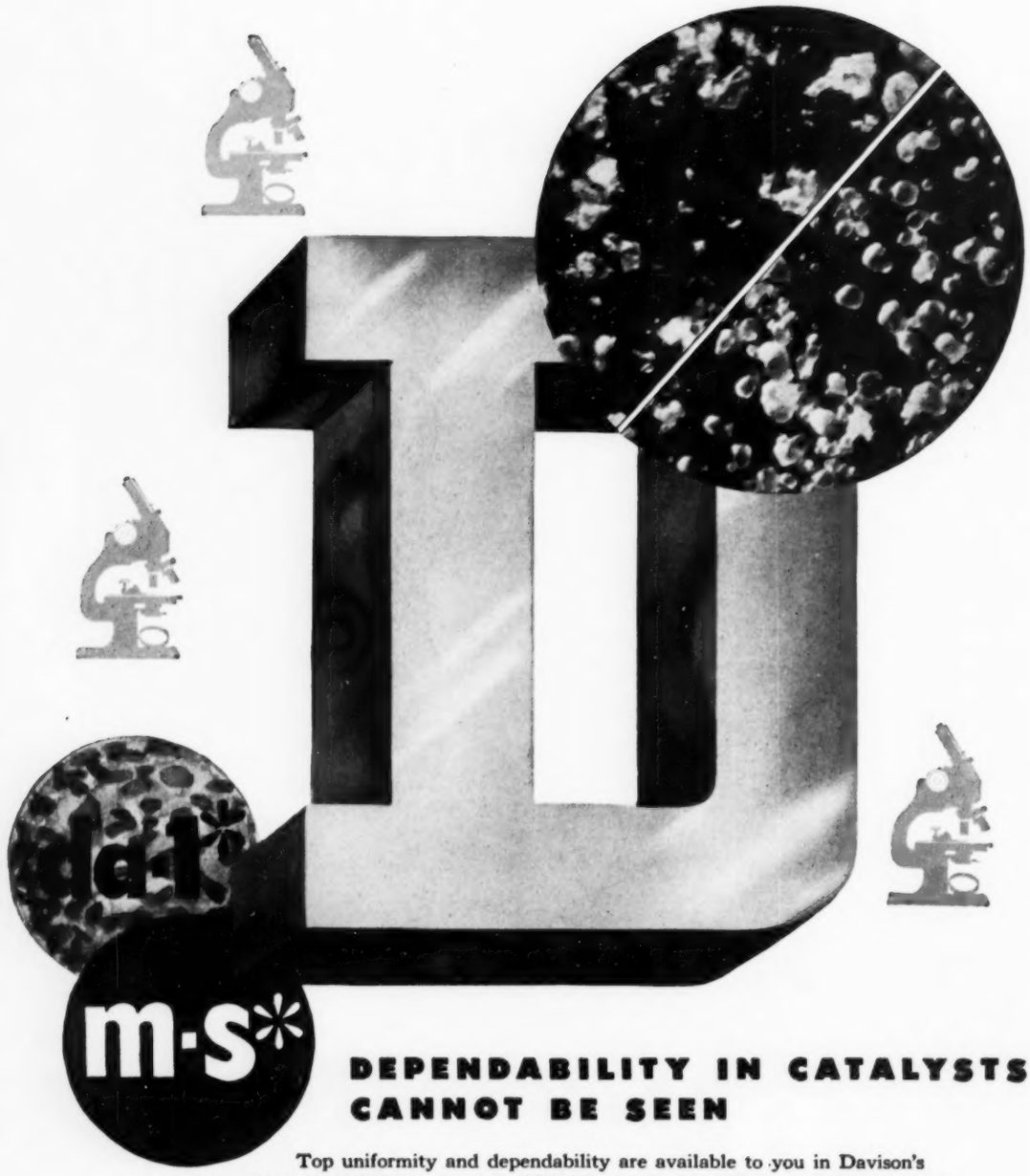

DEPENDABILITY IN CATALYSTS CANNOT BE SEEN

Top uniformity and dependability are available to you in Davison's microspheroidal (M-S*) or ground (DA-1*) synthetic fluid-type cracking catalysts. The accompanying photomicrographs show the physical characteristics of the DA-1 and new M-S catalysts produced in Davison's Cincinnati plant. Uniform physical and catalytic characteristics result from Davison's modern facilities and years of technical experience and research. Experienced Davison Field Service Engineers—complete laboratory facilities—are all part of Davison Dependability—Dependability with the big "D".

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Baltimore 3, Maryland

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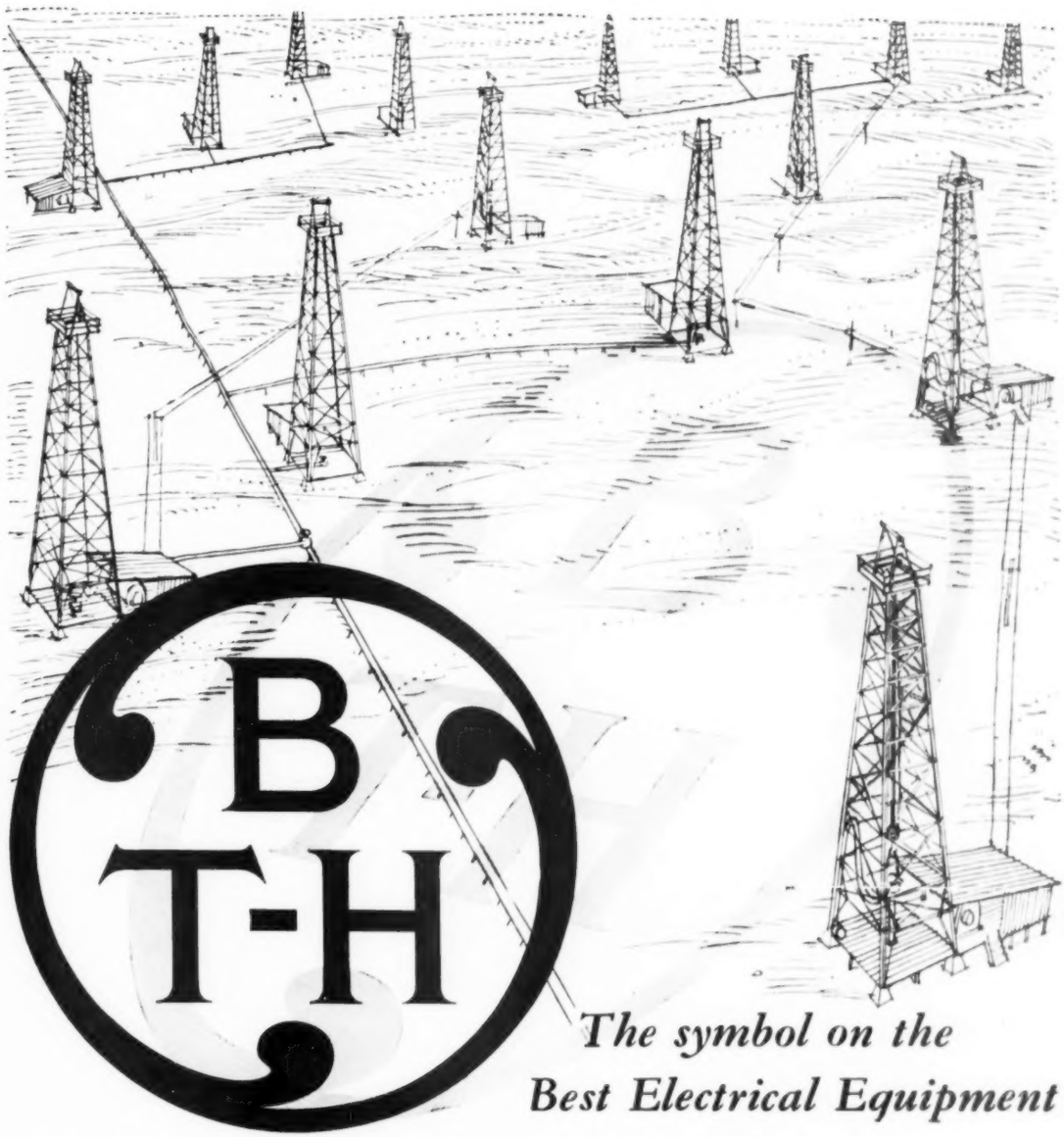

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Hard and continuous service is demanded of any electrical equipment in the oil industry. That is why in the fields so many of the generators, motors, starters, and other devices bear the initials BTH—symbol of sound design and of guaranteed reliability in service.

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Through its member companies . . . each a recognized leader in its field . . . Dresser offers its customers the personalized, specialized experience of a small concern. Offers them this and more. Each member company can draw upon the pooled resources of engineering know-how and research facilities of the entire Dresser Industries organization . . . thus giving even greater service at no extra cost.

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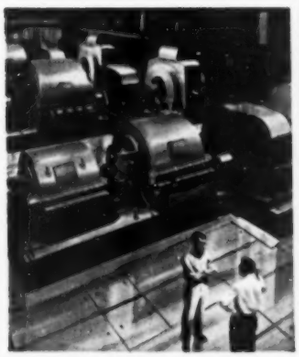

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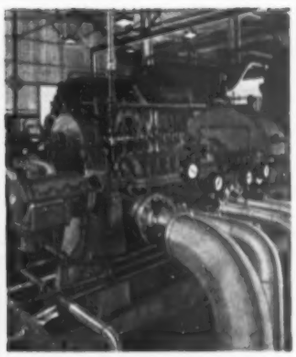

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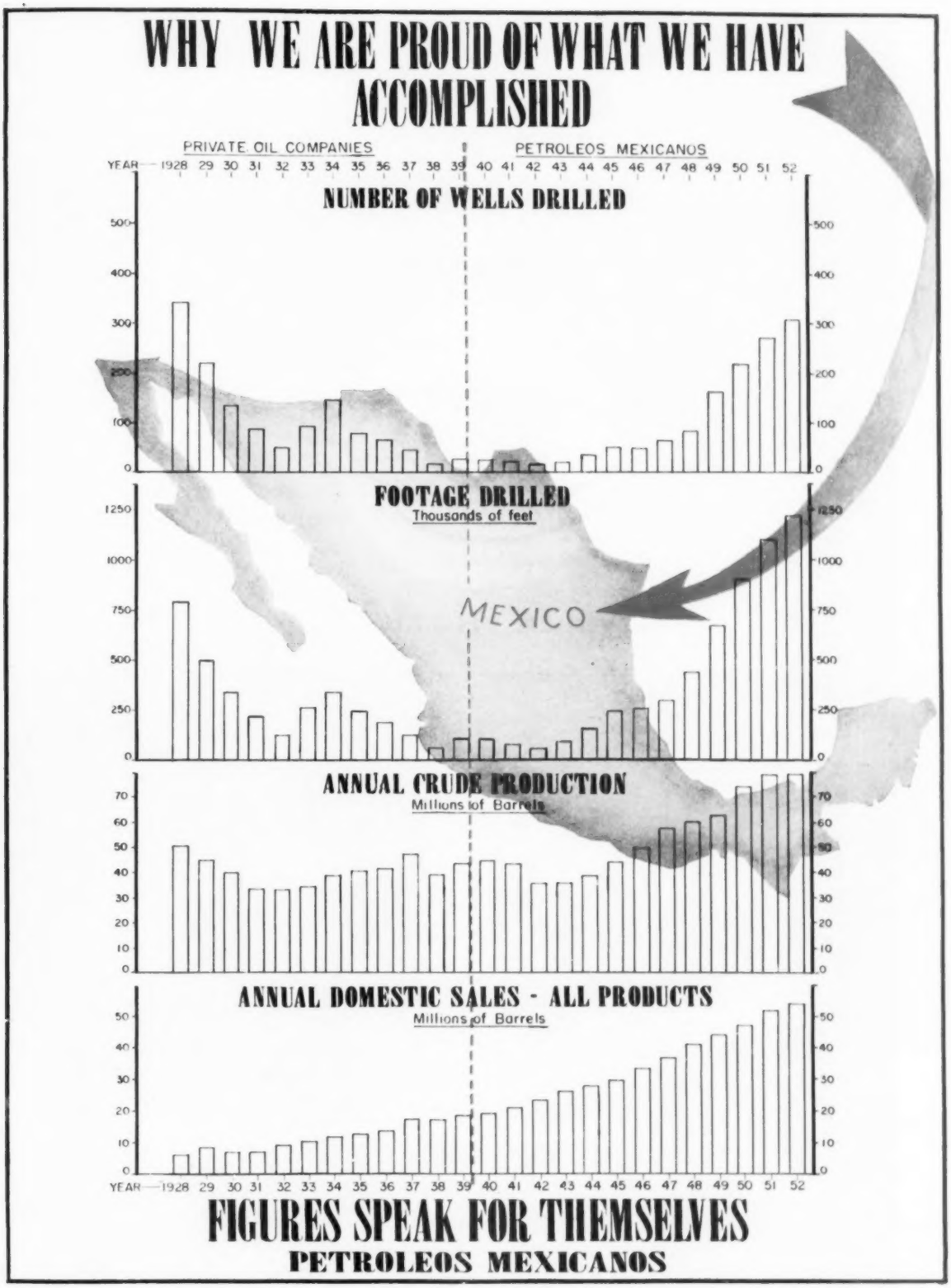
20 WORLD PETROLEUM


WHY WE ARE PROUD OF WHAT WE HAVE ACCOMPLISHED
PRIVATE OIL COMPANIES
PETROLEOS MEXICANOS
YEAR 1928 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
NUMBER OF WELLS DRILLED
FOOTAGE DRILLED
Thousands of feet
MEXICO
ANNUAL CRUDE PRODUCTION
Millions of Barrels
ANNUAL DOMESTIC SALES - ALL PRODUCTS
Millions of Barrels
FIGURES SPEAK FOR THEMSELVES
PETROLEOS MEXICANOS

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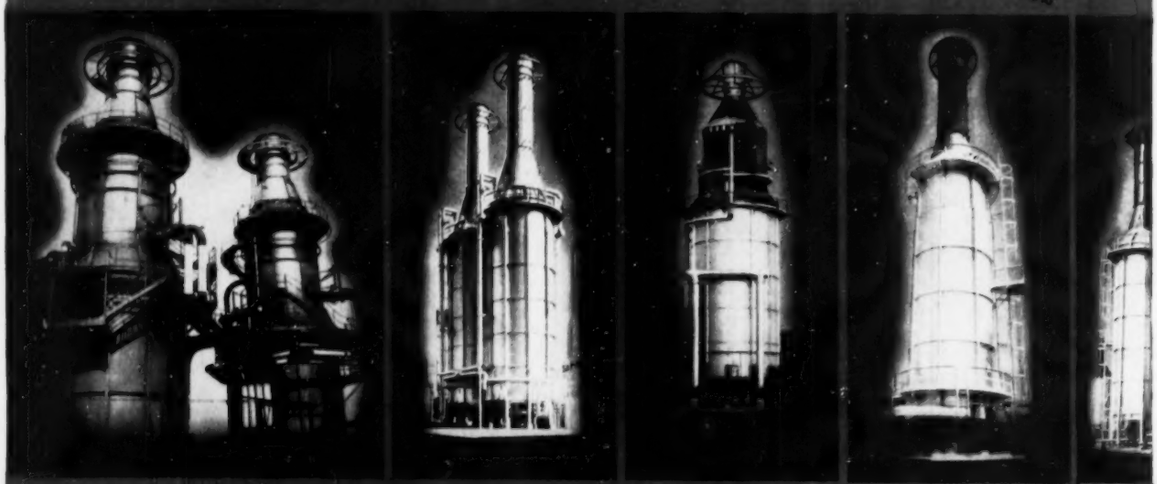

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✳ UNIFORM HEAT DISTRIBUTION

Uniform heat distribution, the most desirable characteristic of any fluid heater, is created in an Isoflow furnace as the result of the following design characteristics:

1. Individual burners, symmetrically spaced with relationship to the tubes, create a symmetrical flame pattern with relation to the heating elements.
2. The metal cone at the top of the combustion chamber re-radiates to the tubes, also diverts products of combustion progressively closer to the tubes, and combines the proper proportion of radiant and convection heat to give the uniform heat intensity at the upper portion of the combustion chamber.
3. The combustion gases are diverted behind the tubes so that the gases recirculate from the top of the heater downward, behind and between the tubes, thus increasing the heat input to the rear of the heating elements by convection.
4. The recirculated gases also serve to reduce the combustion temperature, reducing the heat intensity at the bottom of the furnace.

The above design factors in Isoflow heaters, combined with the angle of the cone, provide the uniform heat distribution required in heaters for the most efficient process operation.

you'll find

operating performance

MOST EFFICIENT BY ANY COMPARISON

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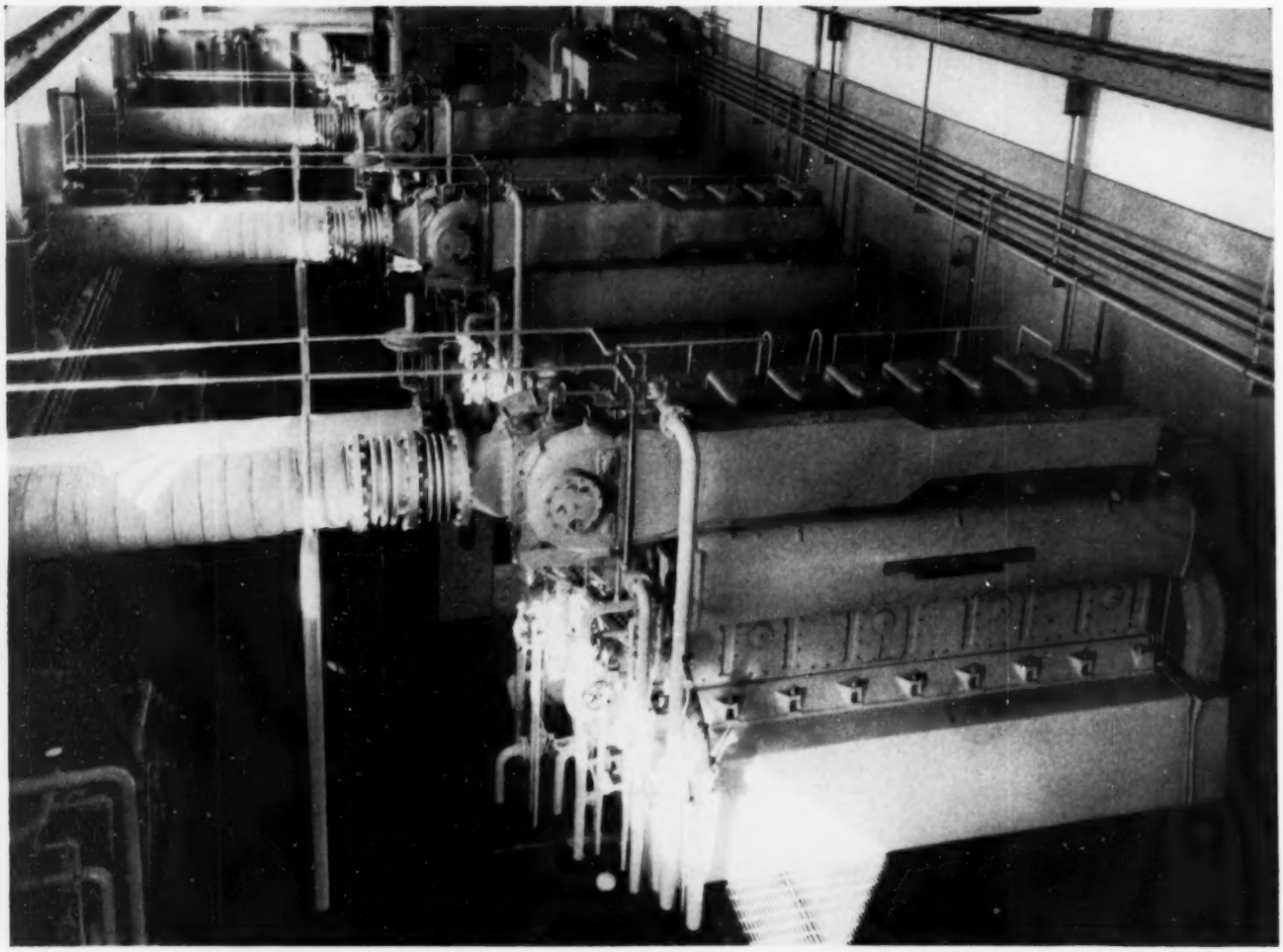

12 Nordberg Supairthermal *Engines are installed in four main pumping stations on the Trans Mountain Pipe Line . . . at Edmonton, Edson, Blackpool and Kamloops.*

Twelve Nordberg *Supairthermal** Engines supply the *"Big Push"* for TRANS MOUNTAIN PIPE LINE

Twelve powerful, compact Nordberg *Supairthermal* Engines have been given the tough power assignment of supplying the "big push" of crude oil from Edmonton, Alta., to Vancouver, B.C., for the Trans Mountain Pipe Line Co., Ltd. These engines, totaling over 20,000 horsepower, are installed in four pumping stations along the route . . . and include nine 1780 hp and three 1330 hp units. Three of these are Duafuel® engines, and the balance are Diesels, using crude oil as fuel. § § § § This is another outstanding example of the way in which Nordberg *Supairthermal* Engines, in Diesel, Duafuel® and Spark-Ignition Gas types, from 535 to 4260 hp, are being used to provide compact, heavy duty, economical power for the petroleum industry. *Nordberg Mfg. Co., Milwaukee, Wisconsin.*

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Especially suited for work in foreign waters, the fully-equipped GSI *Sonic* carries sufficient supplies for a long stay at sea, is able to proceed under its own power to your program area. Inquire now, at no obligation, for availability. Write for folder giving details of this new GSI service.

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It's the # CATALYST

That's why

you should know the story

behind the

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THAT COUNTS

Many years have gone by since catalytic reforming was first utilized by the petroleum industry. As with many developments, earlier methods fell far short of ideal.

Many years ago Atlantic's engineers and chemists looked well ahead to the more demanding needs of industry-wide commercial application. They devoted themselves to continuous and unrelenting laboratory research. One catalyst after another was rejected for failing to meet Atlantic's projected ideal catalyst. Finally, a catalyst possessing new characteristics and demonstrating an ability to surmount the shortcomings of previously developed catalysts was found. This completely new catalyst, combining the advantages of improved selectivity, greater stability, excellent resistance to poisoning, and easier regeneration, is the heart of CATFORMING.

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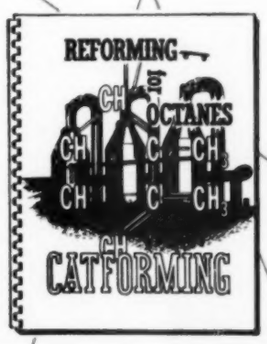


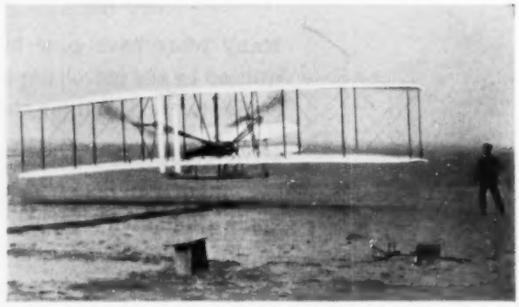
This detailed bulletin yours for the asking!

ATLANTIC

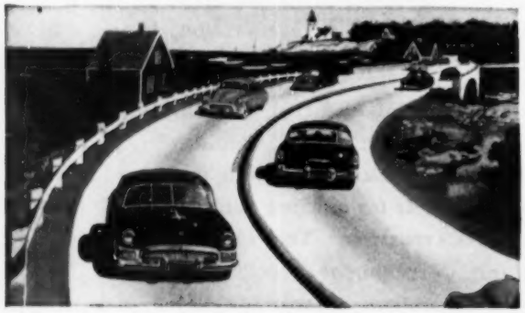
FOR 50 YEARS

The Greatest Name in Motor Oil!

Before 1903 motor oils used in cars had been developed for other purposes. Then came *Mobiloil*—first *successful* motor oil specifically developed for cars—and the auto industry was on its way!



It was at Kitty Hawk in 1903 that the Wright brothers made the first successful plane flight. On this occasion, and on other pioneering flights, they chose *Mobiloil* for top engine protection!



Today's car builders generally recommend a *heavy-duty* motor oil. New super-detergent *Mobiloil* more than meets this requirement—cuts engine wear, helps give longer engine life, better economy!

Today's sky-clippers set new safety records with oils made by the makers of Mobiloil!

1903 · 1953 50TH ANNIVERSARY

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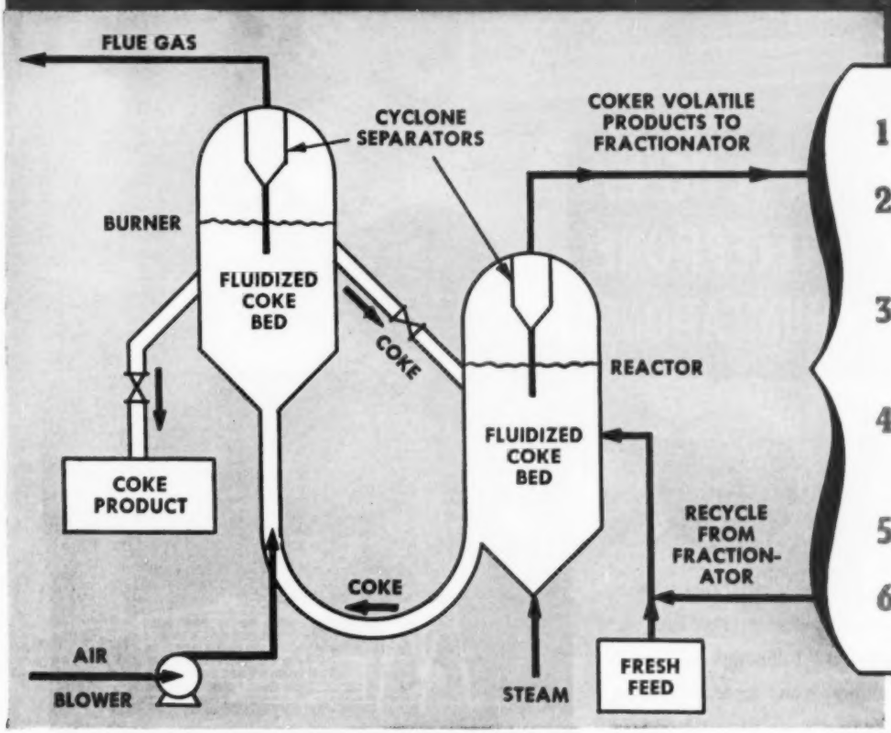
SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO. GENERAL PETROLEUM CORP.

FLUID COKING*

offers you these advantages



1. **Continuous operation**
2. **Broad flexibility of both feed and products**
3. **Higher ultimate gasoline yield**
4. **Residual products yield reduced to a minimum**
5. **Low plant investment**
6. **Economical operation**

* *Licensed by Standard Oil Development Co.*

McKee Engineering Assures You Correct Plant Design

MCKEE services assure you a Fluid Coking plant designed and constructed to obtain fullest advantages of this new process.

MCKEE Company's enlarged process engineering facilities, design, engineering, purchasing and construction services are backed by a long, successful record on all types of refining facilities.

For Fluid Coking, as for all the other refining processes, you can depend on it—*McKee Engineering means Assured Results.*

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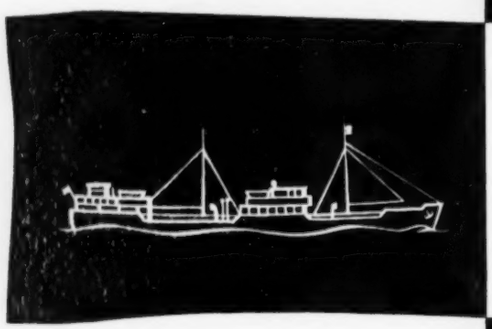
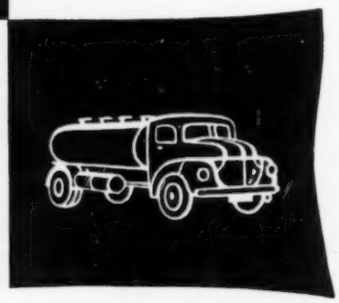
Ranking high among the benefits derived from V.H.F. radio-telephone communication is the control of mobile vehicles and personnel. The Pye "Reporter" fulfils this function in admirable and versatile fashions.



A compact and economical equipment, it is designed to fit neatly under vehicle dashboards but is also available in transportable form. Reason enough that it should feature so prominently in over two-thirds of the V.H.F. schemes in the United Kingdom.



PYE Telecommunications

PYE LIMITED • CAMBRIDGE • ENGLAND

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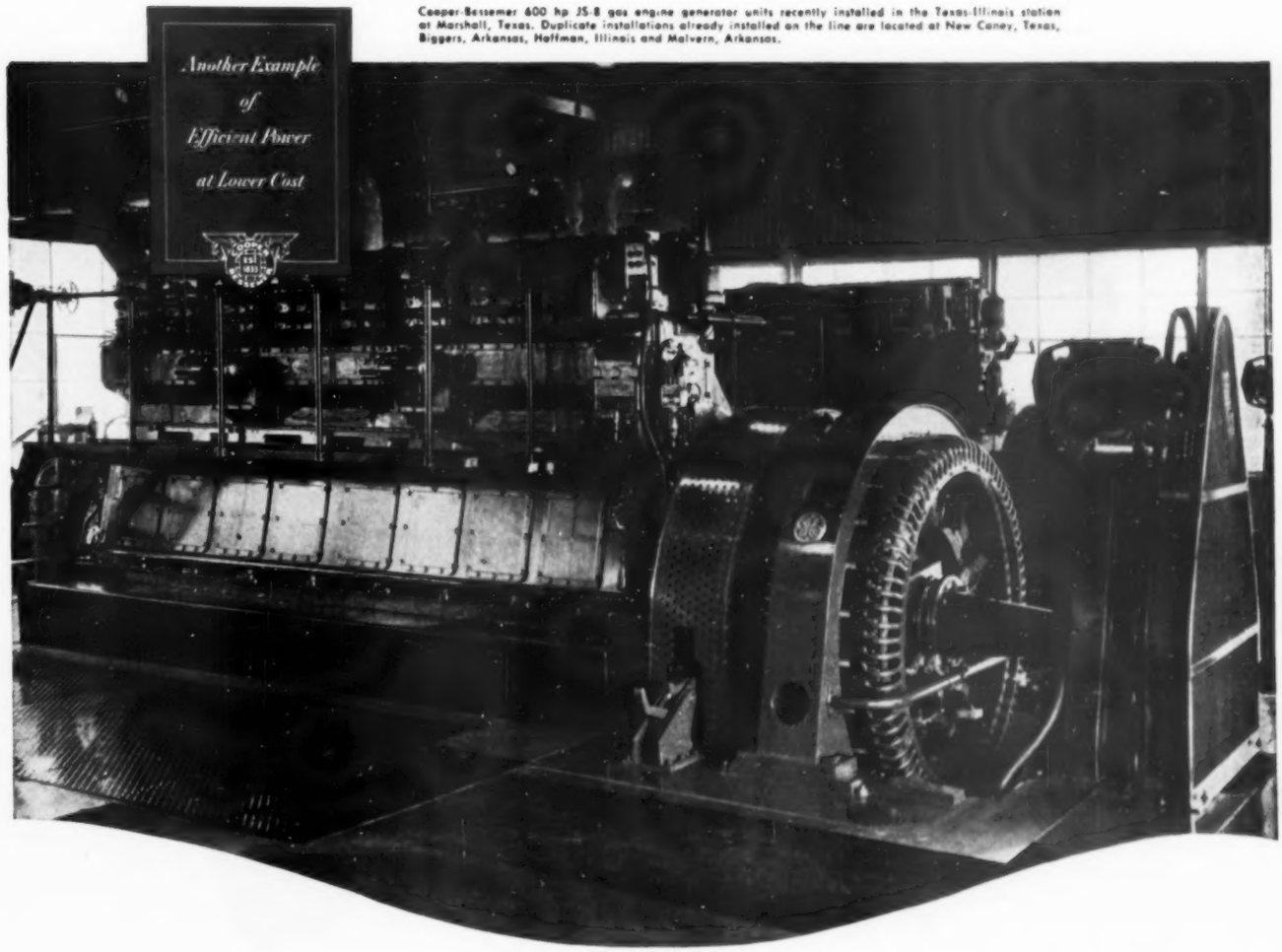

Cooper-Bessemer 600 hp JS-8 gas engine generator units recently installed in the Texas-Illinois station at Marshall, Texas. Duplicate installations already installed on the line are located at New Caney, Texas, Biggers, Arkansas, Hoffman, Illinois and Malvern, Arkansas.

24-YEAR PROGRESS WITH COOPER-BESSEMERS

on the Texas to Illinois Lines

SHOWN here are some of the latest Cooper-Bessemer gas engine generating units installed in Texas-Illinois Natural Gas Pipeline Company's new pipeline. Modern JS's like these have now gone into five Texas-Illinois stations; will likewise power 4 more new stations as the year goes on.

Texas to Illinois experience with Cooper-Bessemer power dates back to 1929 when Cooper-Bessemers were first installed on the old Texoma and Natural Gas Pipeline Company of America lines. Like the modern JS's, these old engines were noted for dependability, low maintenance and high efficiency . . . and they're still running!

But progress plays tricks with standards. For example, the old Texas to Illinois engines offered 25% thermal efficiency — 10,000 B.T.U. consumption per bhp/hr. Today, you can install Cooper-Bessemers guaranteed not to exceed 6500 B. T. U. per bhp/hr.

Think what this unmatched 40% thermal efficiency means in dollars saved. It's equivalent to buying your gas at older, lower rates! Better check up on what you stand to gain and save with modern Cooper-Bessemers on the job.

COOPER-BESSEMER

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Cooper-Bessemer of Canada, Ltd., Edmonton, Canada

DIESELS • GAS ENGINES • GAS-DIESELS • ENGINE-DRIVEN AND MOTOR-DRIVEN COMPRESSORS • HIGH PRESSURE LIQUID PUMPS

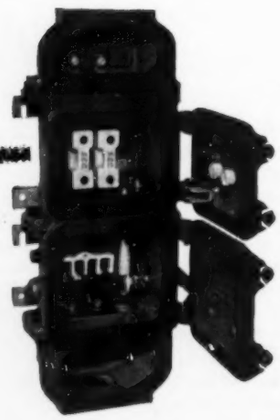
Typical flameproof distribution board.

G.E.C. Flameproof

SWITCH FUSES & DISTRIBUTION BOARDS

To B.S. 229 & B.S. 861

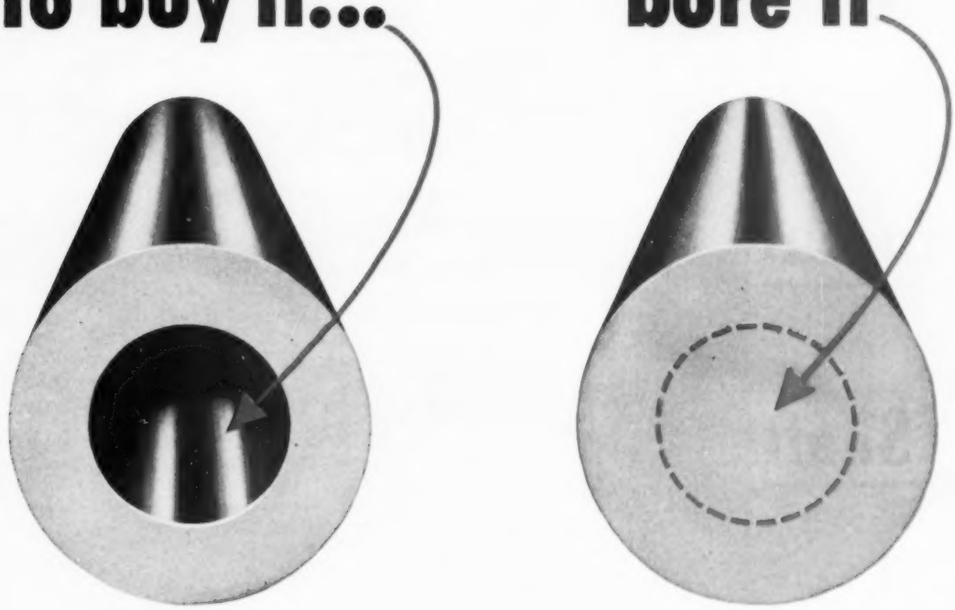
660 v. switch fuse unit with terminal box.



For controlling power and lighting circuits where flameproof gear is necessary in positions such as Mines, Petroleum Refineries and similar installations. The units have a maximum capacity of 100 amps. 660 v. and are readily adaptable to individual requirements, each component being housed in a separate cast iron flameproof enclosure. Approved for groups I, II and III gases by Buxton Certificates.

THE GENERAL ELECTRIC CO., LTD., OF ENGLAND, MAGNET HOUSE, KINGSWAY, LONDON, W. C. 2

It's cheaper to buy it... than to bore it



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Finish boring is often the first step in production. Screw machine stations can be released for other operations. You get added machine capacity without additional machines.

To help you save even *more* steel, the Timken Company's engineers will study your problem and recommend the most economical tube size for your hollow parts job — guaranteed to clean up to your dimensions.

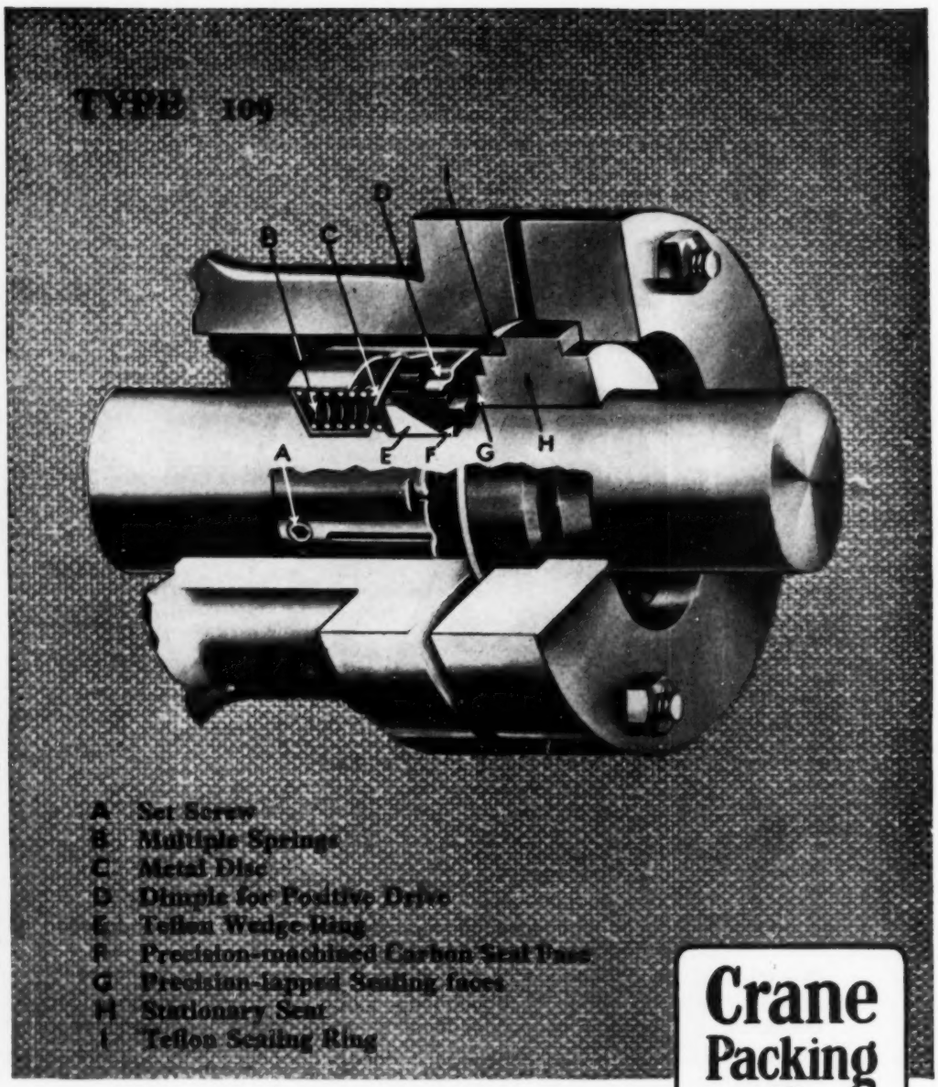
Because the piercing process by which it is made is basically a forging operation, Timken seamless tubing gives you high internal quality. It has a uniform spiral grain flow for greater strength and a refined grain structure which brings out the best in the quality of the metal. And the Timken Company's rigid quality control keeps this quality uniform from tube to tube and heat to heat.

If you make hollow parts, why not let us help you save machining time, steel and money? Write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

A Mechanical Shaft Seal



for High Temperature & Corrosive Services

Crane Packing LTD OF SLOUGH ENGLAND
A COMPANY

This Type 109 Mechanical Shaft Seal will seal off corrosive fluids or gases which are being handled at temperatures up to 485° F. and at pressures up to 750 p.s.i. on such applications as centrifugal pumps, turbines, positive displacement pumps, agitators, etc. It is the first Seal of its kind to be manufactured in this country—it is precision engineered and corrosion resistant materials can be used for each component.

In order to impart to the assembly the required degree of flexibility a flexible wedge ring is used (see "E" on diagram). The new chemically inert polymerised plastic fluorethylene known as Teflon in the U.S.A. and as Fluon in this country, is the material from which this wedge ring is formed by means of special moulding and machining processes. All metal parts can be of stainless steel, or special alloys, depending on the nature of the service conditions.

Interested Engineers are invited to send for illustrated literature describing the Type 109 Mechanical Shaft Seal.

This is one of the many mechanical shaft seals which we manufacture for a wide range of services. We manufacture this design of seal by agreement with the Crane Packing Co. of Chicago, U.S.A.

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The drillers who operate rigs day in and day out are the men who can give you the real facts about draw works. Drillers with experience on the Model U-34 Draw Works will tell you of the convenience of the single lever throttle and clutch control, the smooth operating clutch, the dependable Hydromatic brake, and the many other features that make drilling faster — safer. Ask the driller on any UNIT RIG Draw Works why UNIT RIG is your best draw works buy.

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FLOATING ROOF DESIGN?

Here are the Floating Roof Specifications which 30 years' experience has shown are necessary for best performance.

1. **Well designed, close fitting Seals; including Primary, Secondary, and Top Seals for maximum conservation.**
2. **Pontoons divided into large number of GAS-TIGHT compartments for safety.**
3. **Pontoon compartments Deep and Roomy so they may be easily entered and inspected for maintenance if necessary.**
4. **Pontoon compartments uncluttered with framework for easy inspection and maintenance.**
5. **COMPLETE CLEAN Drainage.**
6. **Roof designed to take ALL LOADS to which the structure may be subjected, with better than normal safety factor.**
7. **Pontoons designed to maintain buoyancy under all anticipated conditions.**
8. **Assure full use of the capacity of the tank for in and out storage.**

These specifications are met in every respect by the Wiggins Floating Roof and ONLY the Wiggins Floating Roof

by GENERAL AMERICAN

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GENERAL AMERICAN TRANSPORTATION CORPORATION

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Tokyo, Japan

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Toronto Iron Works Ltd.
629 Eastern Avenue
Toronto, Ont., Canada

REFINERY PROCESS NEWS

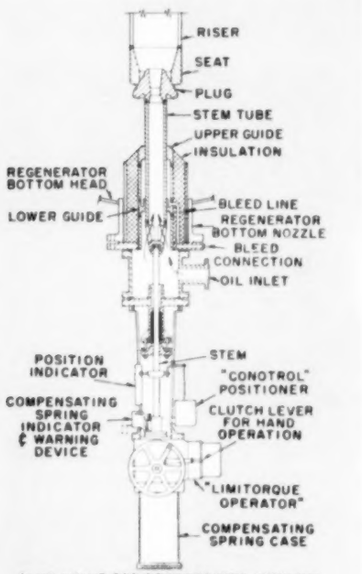
PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY NOVEMBER 1953

Patented Plug Valve Key to Orthoflow's Operating Ease

Unique mechanical features of the Orthoflow Fluid catalytic cracker are the plug valves which replace the more conventional slide valves. Designed and patented by Kellogg, they might well be termed the key to the decreased investment, easy operation and low maintenance cost of the Orthoflow.

Not only do they make feasible the elimination of expansion joints in certain of the Orthoflow units, but also they are much more easily maintained than slide valves. Actually, the new valves make possible the basic advantage of the Orthoflow: Straight-line flow of catalyst with its concomitant reduction in erosion.

The plug valves are so arranged that they can be unflanged, lowered from the bottom head and taken to a shop for maintenance while the rest of the unit is being inspected and repaired.



PLUG VALVE FOR REGENERATED CATALYST

Although the plug of the valve is subjected to the same type of erosion that is encountered in slide valves, and its rebuilding or replacement must be expected after about a year of service, the valve seat and the straight catalyst lines themselves have proven remarkably free of erosion difficulties. Only minor repairs have so far been necessary.

All these factors, coupled with the ease of shut down and start up, make the Orthoflow design a highly attractive one.

Combination Processing Can Reduce Total Investment Costs by More Than 20%

Recently completed economic studies by Kellogg comparing combination refining with conventional sequence-type unit-processing show the remarkable savings in investment and operating costs as well as the improved yields that may be obtained through the integration of a petroleum refinery.

Today it is possible by skillful integration not only to cut the cost of the processing equipment from five to 15% but also to reduce the cost of offsite facilities by as much as 25%. The overall effect results in the possibility of erecting complete new combination refineries at perhaps 20% less than the cost of building comparable capacity in individual process units.

Important savings also result from reduced operating costs such as labor, fuel, power, steam, water, and maintenance.

Although there are savings in utilities—particularly through the conservation of heat due to the virtual elimination of intermediate storage—and in maintenance charges, the largest single reduction in direct operating costs for combination units results from smaller labor requirements. Total operating personnel needs may be slashed by as much as 30%.

In addition to the savings already mentioned, the combination plant has a further advantage in improved yields due to a reduction in evaporation and other losses. An increase in gasoline yield of about one percent may be expected in a combination unit—an important source of increased earnings and quicker payout. (Shown above is a typical modern combination catalytic refinery.)

NOTE: For more extensive study of combination refining and its advantages send for KELLOGGRAM No. 1, 1953 which compares the economics of 10, 20 and 40,000 BPD combination units with conventional plants of equal capacities.

SEE REVERSE SIDE

REFINERY PROCESS NEWS

CONTINUED FROM PRECEDING PAGE

Operating Data Reveals Kellogg Reactor Efficiency

Recent operating data from two relatively new sulfuric acid alkylation plants clearly reveal that the Kellogg cascade reactor is highly effective in producing excellent yields of high-octane alkylate with a minimum consumption of acid.

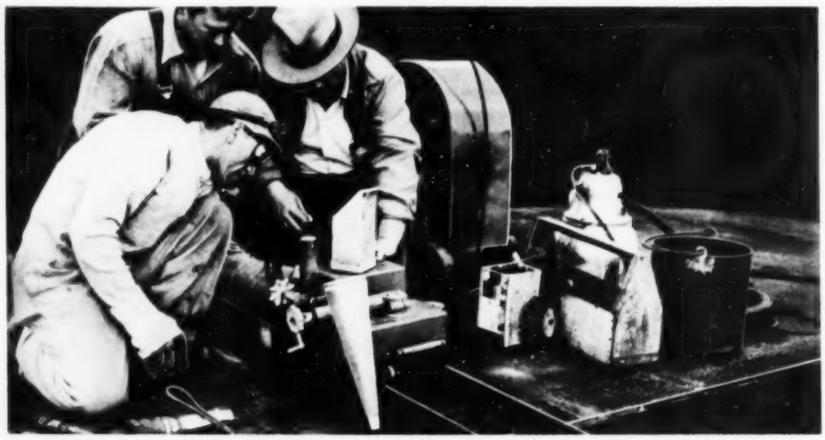
While the data from both units indicate efficient performance, it is interesting to note the difference in the yield, octane rating and consumption of acid in the instance where the feed contains a high percentage of propylene.

As shown in the accompanying tables, propylene is a satisfactory feed, but it does not produce as high octane numbers or consume as little acid as butylene alkylation.

			Butylene Mo. %	Propylene Mo. %
Olefin feed composition		C_3H_6	6.4	23.5
		C_3H_8	19.5	15.2
		iC_4H_{10}	33.8	29.9
		nC_4H_{10}	17.4	4.2
		C_4H_{8-1}, C_4H_{8-2}	20.5	23.8
		C_5H_{10}, C_5H_{12}	2.4	3.4
		Total	100.0	100.0
Acid consumption lbs./gal. total alkylate			0.7	1.05
Light alkylate inspections	°API		70.8	72.8
	ASTM Dist. °F	IBP	120	110
		10	180	150
		20	200	170
		50	220	200
		90	240	240
		EP	340	320
		% REC	98.0	99.0
	RVP		5.6	5.8
	Octane	F-1 Clear	96.2	93.4
Light alkylate yield (Basis total alkylate)			95 LV. %	93 LV. %

Kwinana Refinery Takes Shape

Work is proceeding steadily on the new Anglo-Iranian refinery at Kwinana, Australia. (Above) Progress on the Orthoflow Fluid catalytic cracking unit . . . the guy derrick is just being installed for lifting the various towers and vessels onto the foundations which may be seen in the center of the site. The unit will be a Model "B" Orthoflow in which the regenerator is located on top of the reactor to reduce compressor horsepower requirements. (Below) A typical example of the use of standard shop equipment in field fabrication. Shown is a portable continuous welding machine, being used here for the fabrication of tank shell plate.



Autofining Economics are Attractive . . .

Although Autofining, AIOC's new desulfurization process licensed by Kellogg, shows excellent economics in comparison with acid treating as a method of removing sulfur from kerosene, it shows an even more attractive payout time when it is used to treat gas oil.

The economic summary below takes into account direct operating costs and treating losses, but excludes taxes, depreciation, interest and royalty for both treating methods. Direct operating costs include labor, maintenance, utilities, chemicals and catalyst. Acid required for treatment of kerosene and gas oil is 15 and 40 lbs./bbl. respectively. The payout periods on incremental investment for the Autofining cases are very short, and the Autofining process appears to be both an economical and flexible method of reducing the sulfur content of straight-run petroleum distillates.

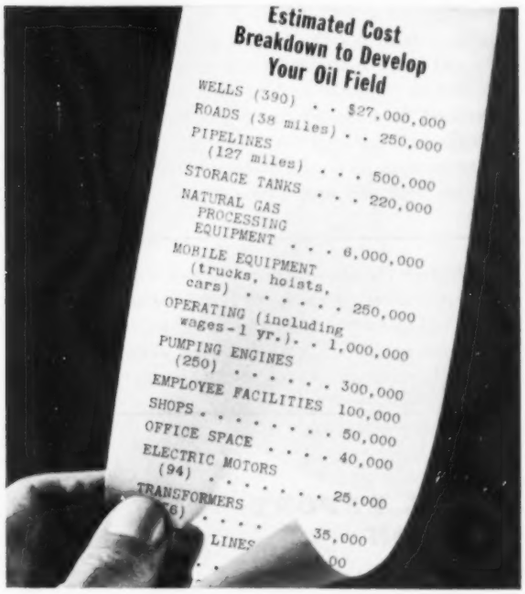
	KEROSENE (Sulfur reduced from 0.4 to 0.03 wt. %)		GAS OIL (Sulfur reduced from 1.1 to 0.6 wt. %)	
Investment, 3,500 BPSD Plant	$650,000	$320,000	$800,000	$320,00
Direct Operating Costs, $/Bbl	0.095	0.218	0.104	0.485
Treating Loss, Vol. %	0.5	4.5	1.5	10.0
Incremental Savings for Autofining, $/Year	305,000	—	748,000	—
Payout on Incremental Investment, Years	1.08	—	0.64	—

For further information, technical data, etc., on any refining process, write

REFINERY PROCESS DIVISION
THE M. W. KELLOGG COMPANY
225 Broadway, New York 7, N. Y.
Also Jersey City, Chicago, Los Angeles, Tulsa, Houston, Toronto, London and Paris
KELLOGG — A DIVISION OF PULLMAN INCORPORATED

What would happen after you struck oil?

This? Anyone who's ever owned a piece of property has day-dreamed about striking oil. It could happen —and if it did, what next? Do you go shopping for yachts? Not if you want to develop your well into an oil field by yourself. You'd have to stake your commodore's hat and plenty more to build up a producing field. It's a tough and risky job even for Standard Oil Company of California. Only one wildcat well out of every 44 ever develops into a commercial oil field . . . and the cost of finding out can run into millions of dollars. Standard is able to do this because it is owned by more than 115,000 shareholders, each of whom bears part of the cost. Both small and large companies are essential to the oil business, but companies like Standard bring together the money, manpower and skill required to find and build up a big oil field. In developing one field Standard invested years of time and millions of dollars in drilling, production, construction, maintenance teams —and the work is still going on. Indeed, your dream-well could lead to a yacht . . .

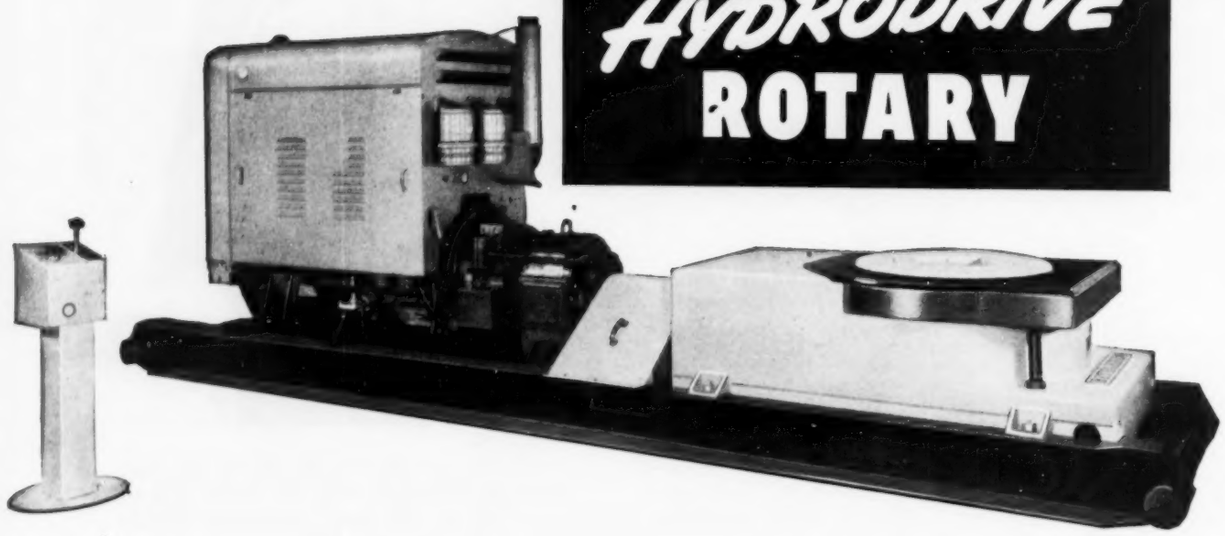

Estimated Cost Breakdown to Develop Your Oil Field
WELLS (390) . . $27,000,000
ROADS (38 miles) . . 250,000
PIPELINES (127 miles) . . . 500,000
STORAGE TANKS . . . 220,000
NATURAL GAS PROCESSING EQUIPMENT . . . 6,000,000
MOBILE EQUIPMENT (trucks, hoists, cars) 250,000
OPERATING (including wages - 1 yr.) . . 1,000,000
PUMPING ENGINES (250) 300,000
EMPLOYEE FACILITIES 100,000
SHOPS 50,000
OFFICE SPACE 40,000
ELECTRIC MOTORS (94) 25,000
TRANSFORMERS
LINES 35,000

But first, here's part of the bill for bringing an oil field into production. It's a good example of how a big oil company works for you. Over the years, Standard has invested in more than 200 such fields to bring you the oil you need. *Questions or comments about our Company are welcome. Write to Standard Oil Company of California, P. O. Box 3495-D, San Francisco, Calif.*

STANDARD OIL COMPANY OF CALIFORNIA

plans ahead to serve you better

Why you're ahead with a BETHLEHEM *HYDRODRIVE* ROTARY



While Bethlehem makes and will gladly furnish rotary tables for drawworks hook-up, we'd like to point out the many advantages of the Hydrodrive rotary unit with independent engine.

First of all, what does Bethlehem offer in this respect? We offer the two most commonly-used sizes—21-in. and 17½-in., *both standard tables.* Either is available with gas or diesel engine and *torque-converter drive.* The system has *two forward transmission ratios, one reverse.*

The flexibility—"independence"—of Bethlehem's Hydrodrive tables makes possible great gains in your drilling set-up. For instance, there's reduced wear on the drawworks. There's complete control at the driller's fingertips. There's an infinite number of speeds from zero to maximum. With separate rotary drive, you are not draining power from the drawworks engines; more power, therefore, is available for the pumps.

Here are some other advantages: greater safety (no chain drives between drawworks and table) . . . more pipe-racking space . . . ready portability (fine for rathole digging) . . . drive and controls that make the units perfect for fishing.

Bethlehem Hydrodrive tables can be used at floor level or underneath the floor, whichever you prefer. And there are other features, too, that you'll want to investigate—because they mean an easier type of drilling. Write for information; complete details will be sent promptly.

Bethlehem also manufactures a complete line of slush pumps and drawworks for shallow, medium, and deep drilling; also crown and traveling blocks, and swivels; and, for production work, pumping units in a wide range of sizes and types. Ask for literature.

BETHLEHEM STEEL

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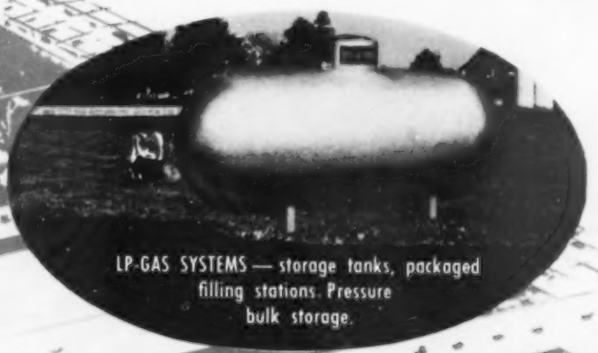
Cable Address "BETHLEHEM, NEWYORK"

PACKAGED COMPRESSOR PLANTS — for field gas gathering and boosting, flare gas collection, gas lift and repressuring.

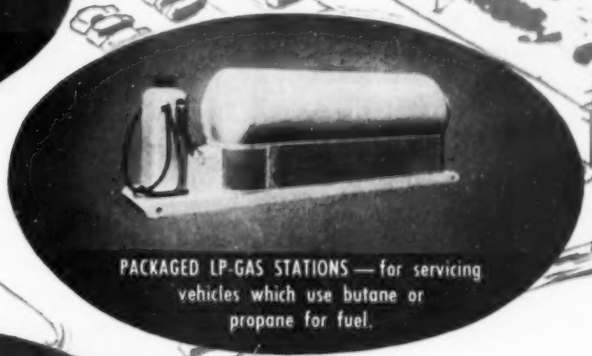
ANHYDROUS AMMONIA TANKS — for truck, trailer and tractor mounting, packaged bulk storage stations.



LP-GAS SYSTEMS — storage tanks, packaged filling stations. Pressure bulk storage.

TRANSPORTS — for L-P Gas and anhydrous ammonia.

CAST STEEL FITTINGS — flanged, screwed, refinery return bend, and pipeline flanges.



PACKAGED LP-GAS STATIONS — for servicing vehicles which use butane or propane for fuel.

PRESSURE STORAGE TANKS — for storing of butane, propane, anhydrous ammonia and other liquefied gases.

SINCE 1919

BEAIRD

SHREVEPORT

MACHINING • MANUFACTURING • STEEL WAREHOUSE

THE J. B. BEAIRD COMPANY, INC.

SHREVEPORT, LOUISIANA

Fractions
SOLVE BIG PROBLEMS

The petroleum industry has made good use of the "divide-and-rule" formula that conquered kingdoms . . . to win command of the giant powers hidden in nature's oil. The industry's process engineers have transformed American life by their mastery of petroleum's secrets . . . and fractionating has been their master key.

These engineers' ability to develop processes which break petroleum into its component fractions has harnessed the "black gold" into a myriad forms of service. There have been other important results, too. The gigantic motor industry . . . America's vast network of modern highways . . . the services to motor travel—these are largely by-products of the petroleum process engineer's knowledge of fractional distillation.

For many years, Sun Ship has been adding to its own prestige by the service and cooperation its great shops give to the petroleum industry, and to the many other industries which call on Sun Ship's versatile engineering and construction skills. It has built . . . for chemical and petroleum process engineers, and for refineries throughout the world . . . the immense fractionating towers, pressure vessels, special machinery and heavy equipment they require. The 95'7" crude tower shown in the photograph, ready for shipment, is a representative example.

Sun Ship's services will continue to keep pace with the giant strides made by the nation's industries in the engineering progress which is steadily building a greater America.

Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE (SINCE 1916) CHESTER, PA.

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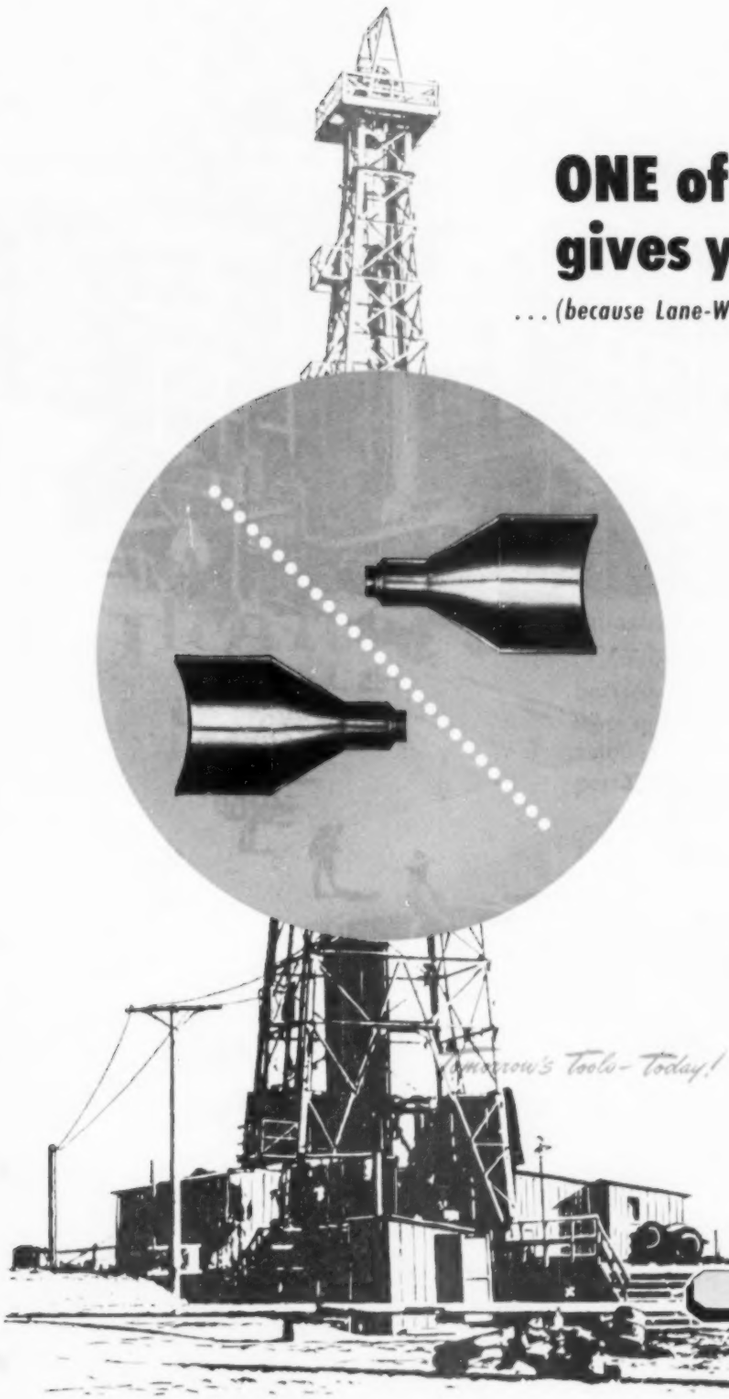

ONE of these charges gives you extra value

. . . (because Lane-Wells will fire it in a KONESHOT gun)

And that means that you'll get, in addition to deep penetration, all the *extra* advantages which Lane-Wells puts into shaped-charge perforating. These include:

ACCURATE DEPTH MEASUREMENTS, to put that deep penetration exactly where you order it.

SERVICE—BUT FAST! Lane-Wells has 72 branches to give quick service, 24 hours a day, to every active oil field.

EXPERIENCE. Call it "Know-how," if you like—Lane-Wells crews have plenty of it!

SAFETY. Extra protection to well and men, because of Lane-Wells proven safety features.

These are the things that make

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the "plus-value" shaped-charge perforating

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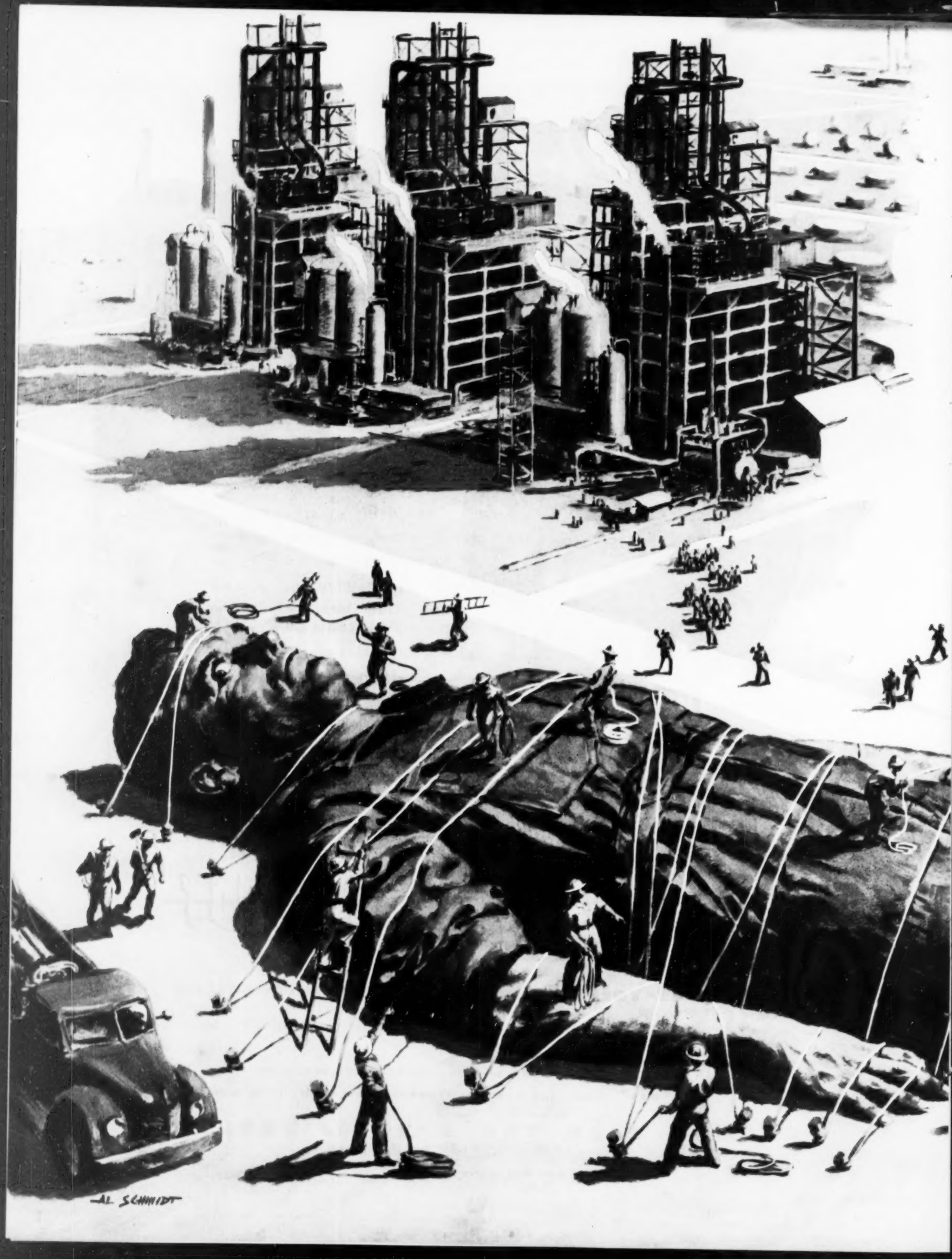
AL SCHMIDT

How Would You Go About Taming a Giant?

FOR MILLIONS OF YEARS the Giant slept.

In 1863, Man disturbed his mighty slumber, tamed him and put him to work for the good of all.

The Giant was called Petroleum.

How did enterprising men go about harnessing this stupendous new source of energy?

Here is how they did *not* go about it:

They did *not* turn the problem over to a government agency.

They did *not* say, "Whale oil is good enough. Why bother with this newfangled stuff?"

They did *not* say, "Too many problems involved. Too many risks. We might lose our shirts."

They *did* get to work and promote risk capital for drilling.

They *did* make this new source of energy available to all the people.

They *did* seek—and find—new ways to put the Giant's talents to work making hundreds of new products, creating thousands of new jobs.

Among these energetic giant-tamers were men of Cities Service. They had begun as processors of whale oil. They were quick to see the possibilities of "rock oil." They were among the first to study the sciences of combustion and petro-chemistry.

The petroleum Giant is now a docile servant of mankind. It has made our lives easier in countless ways. But Cities Service researchers say it has muscles it hasn't even used yet!

CITIES SERVICE

Quality Petroleum Products

TAKE THE GUESSWORK

out of your truck buying

International performance is proved 3 ways

Be sure of the truck performance you want at the lowest cost. These new Internationals give you value with a capital "IH" because they're proved 3 ways:

1. **Proved BEFORE They're Built**—at the world's most advanced all-truck engineering laboratory. That results in longer truck life, reduced operating and maintenance cost. You get *more* truck for your money.

2. **Proved AFTER They're Built**—at a 4000-acre proving ground in the desert and mountains of the state of Arizona. Economy and stamina are assured after tests under these most difficult conditions on the toughest proving ground in America.

3. **Proved in SERVICE**—by cost-conscious truck operators throughout the world. Every new International is built on engineering principles that have kept International the heavy-duty sales leader for 21 straight years.

See the new Internationals. Compare, drive them. Ask your International Truck distributor for all the facts.

INTERNATIONAL HARVESTER EXPORT COMPANY

World-wide distributor of products manufactured by the International Harvester Company in the U.S.A. and by affiliated subsidiaries in Canada, the United Kingdom, France, Germany, Sweden, Mexico and Australia.

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AUTOMATIC, SELF-SEALING, CONDUIT
GATE VALVE

Newman-McEvoy Valves fitted as part of a complete Christmas tree manufactured by Newman, Hender & Company Limited.

in service on Oilfield Christmas Trees throughout the world

Newman-McEvoy Valves are available with flanged ends (as illustrated.) Screwed or socket weld ends can also be supplied. Valves for 2000 lbs., 3000 lbs., 5000 lbs., and 10,000 lbs. W.O.G. pressures are manufactured in 2", 3", and 4" sizes. Write for illustrated and descriptive brochure.

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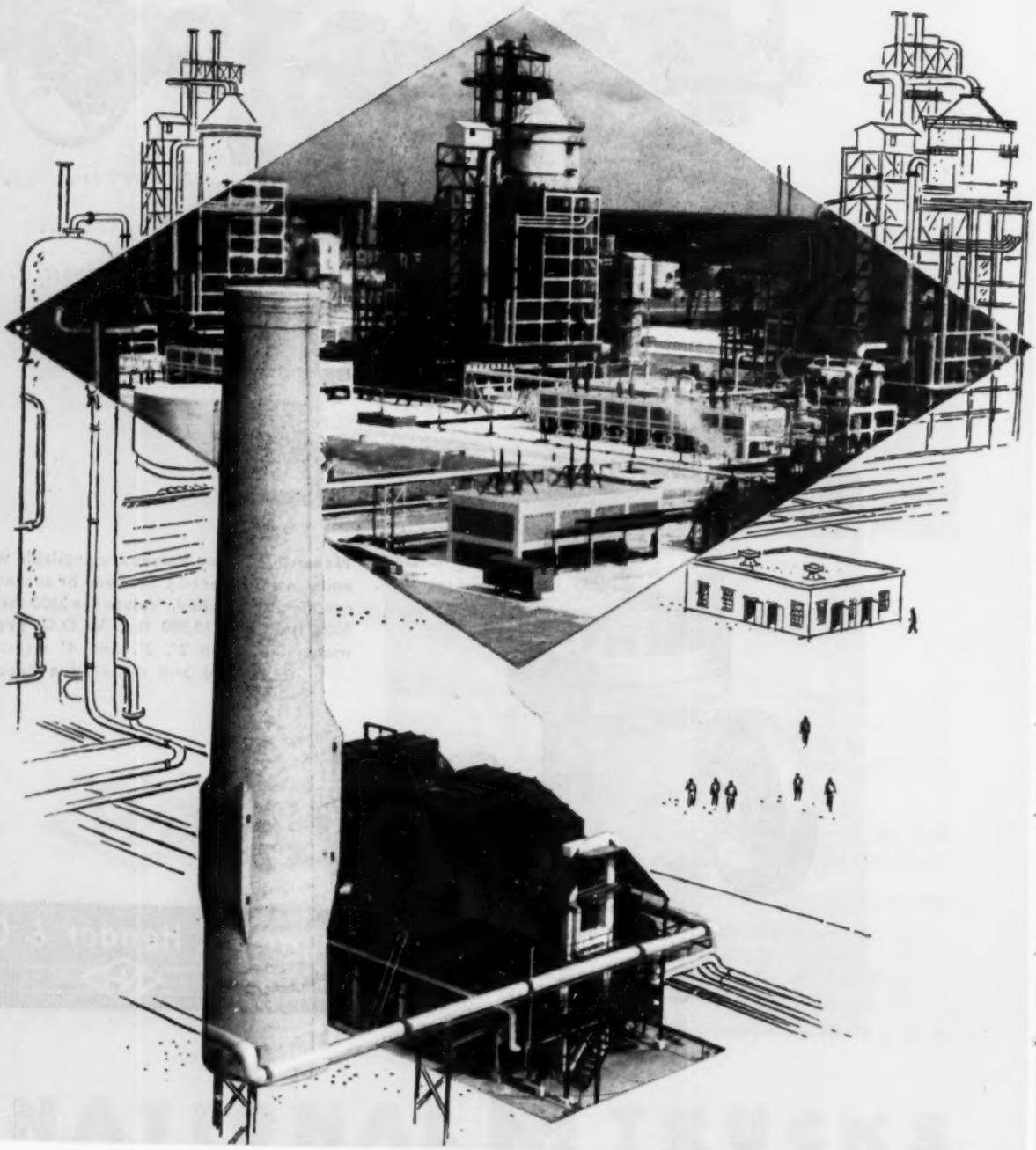
CASTABLES...



48

WORLD PETROLEUM

FOR CAT CRACKING

oil industry favorites!

It's the *catalyst* that speeds the cracking—but it's the *castable* that protects the vessels and makes possible today's ever-more-efficient petroleum products.

Such *quality* castables as Grefco's famous LITECAST, and LITECAST-50 against the shells in so many American crackers . . . and Grefco's High Strength BRIK-CAST to form the tough duty inner sections.

High Strength BRIK-CAST provides exceptional resistance to abrasion, ease of application, extremely low rebound loss. Couple it with LITECAST and you add insulation that means production economy and efficiency.

All through refineries, from coast to coast, you will find these and other Grefco products. Products which offer easy air placement, low thermal conductivity—and application by trowelling where cement gun application is impossible without a change in mix.

Sixty-six Grefco mines and plants—together with hundreds of dealers and warehouses—are at your service. Wherever you may be, you can depend upon quality castables to be on your job quick! Grefco prides itself that it offers all industry strategic sources of supply for dependable and continuous operation.

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Seal in All Your Horsepower!

with the Veedol Motor Oil

"Film of Protection"

USE all the horsepower built into your powerful engine! Seal *in* the great performance your car can give . . . with the world-famous VEEDOL "Film of Protection."

VEEDOL Motor Oil forms a protective anti-corrosion film on metal surfaces . . . helps keep soot, contaminants and gasoline out of your crankcase . . . fights the ravages of acid "engine sweat." So . . .

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Federal Flying -A- Tires . . . Good for a long safe ride!

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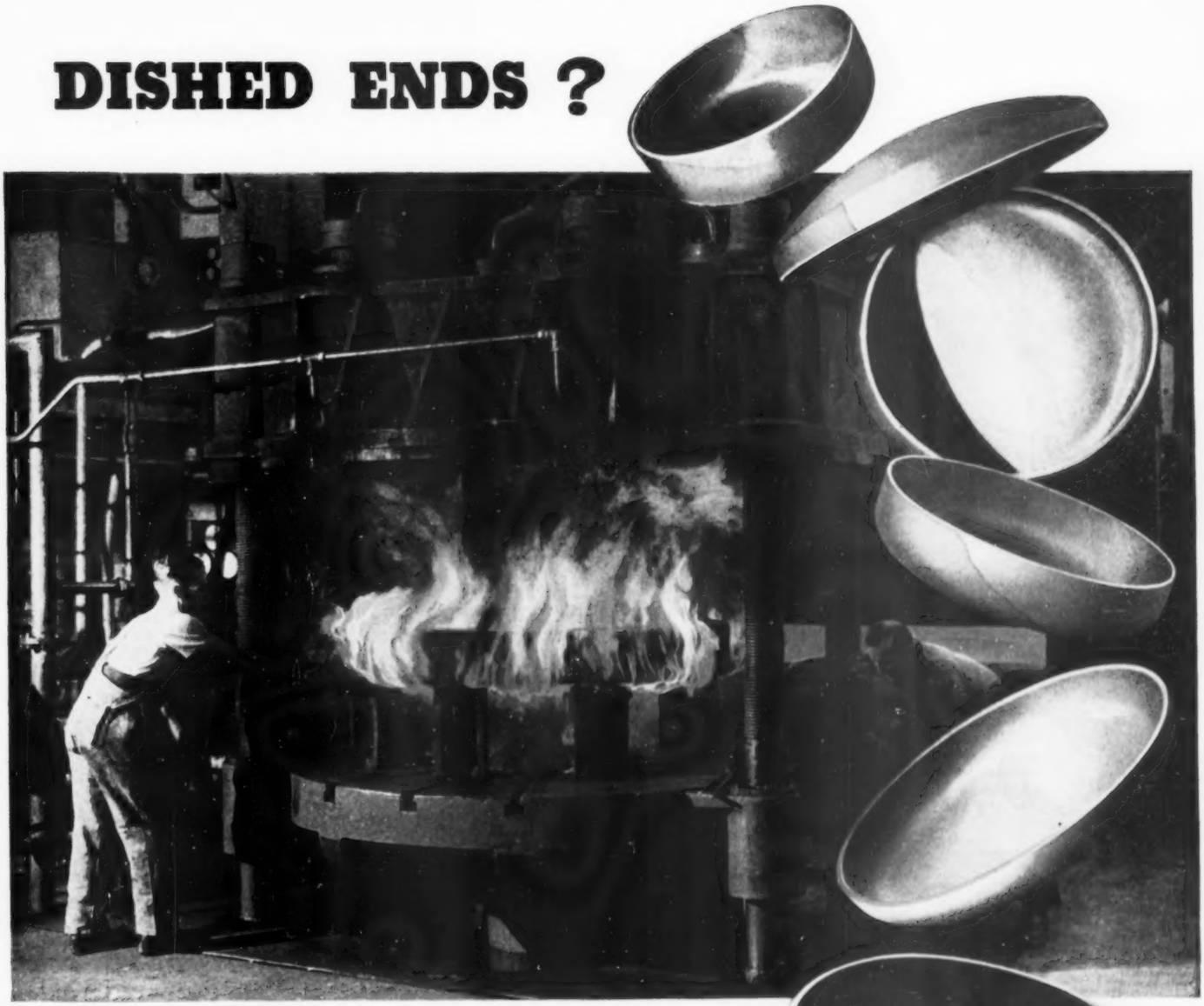
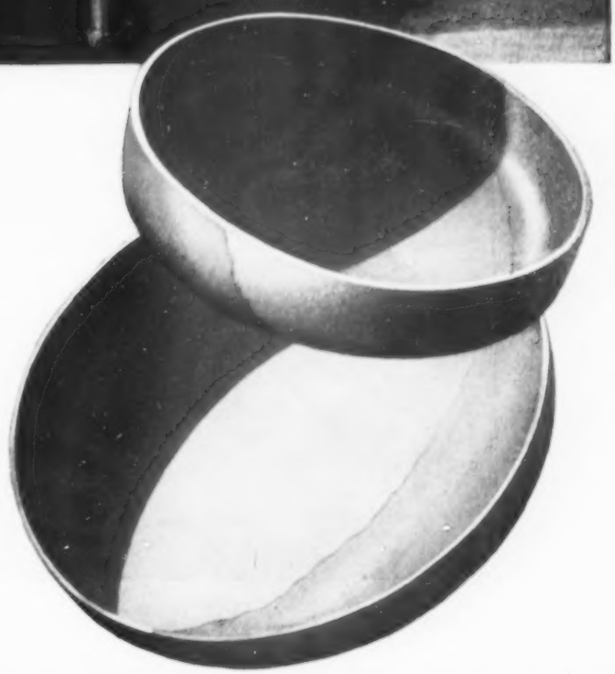




OUT of the furnace and into the press goes the partially finished end . . . up comes the powerful press ring to form the required flange . . . and another Dished and Flanged End is ready.

Furnace and press capacity is available at Harvey's Greenwich works for the pressing of both light and heavy Dished and Flanged Ends. Diameters range from 6″ to 9′ 0″, edges can be prepared for either welding or riveting. For details and tables showing dimensions available, send for List WP 790

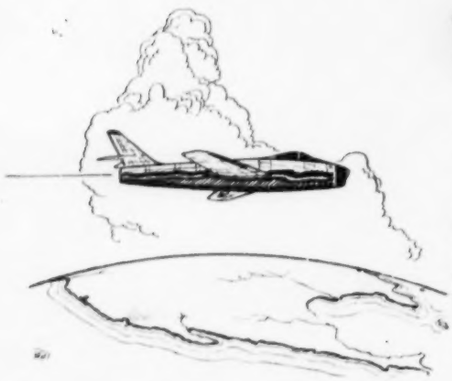
Harvey

G. A. Harvey & Co. (London) Ltd. Woolwich Road, London S.E.7

GRAVER

CONSERVATION TANKS AVAILABLE

Coast to Coast

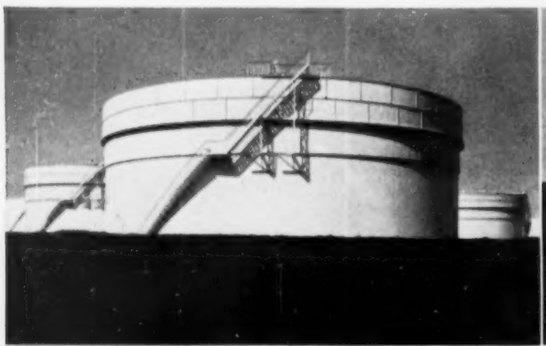


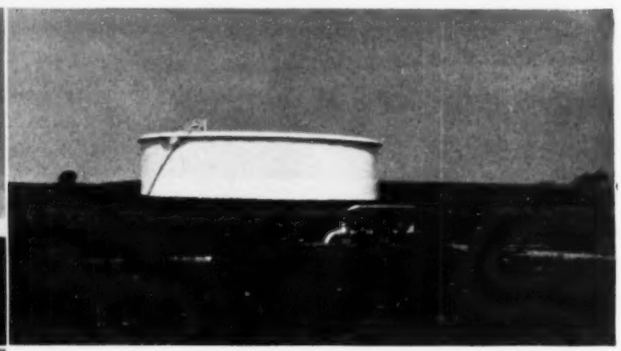
Graver has recently acquired additional facilities at Fontana, California, to serve as another important base for field erection of Graver Conservation Equipment. Now, throughout the country, Graver quality and service are almost literally "at your own back door."

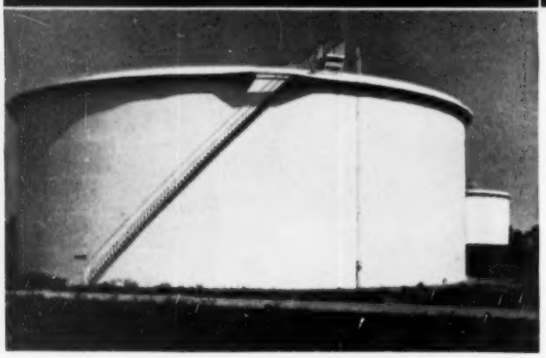
There is a Graver conservation design to suit *your* exact needs. And Graver sales engineers are as close as your telephone. Put our 97 years' experience to work for you!

***the* Graver Expansion Roof Tank** eliminates breathing losses and minimizes filling losses. Its positive liquid seal, exclusive with Graver, protects under all conditions. Ideal for converting existing tankage, and simple to maintain, the Expansion Roof Tank may well protect an entire terminal.

***the* Graver Center-Weighted Floating Roof Tank** combines the economy of the pan-type roof with the stability of the double-deck floating roof. Built to principles of ship design, the roof is stable and will neither sink nor tilt. The entire deck is completely accessible for inspection.



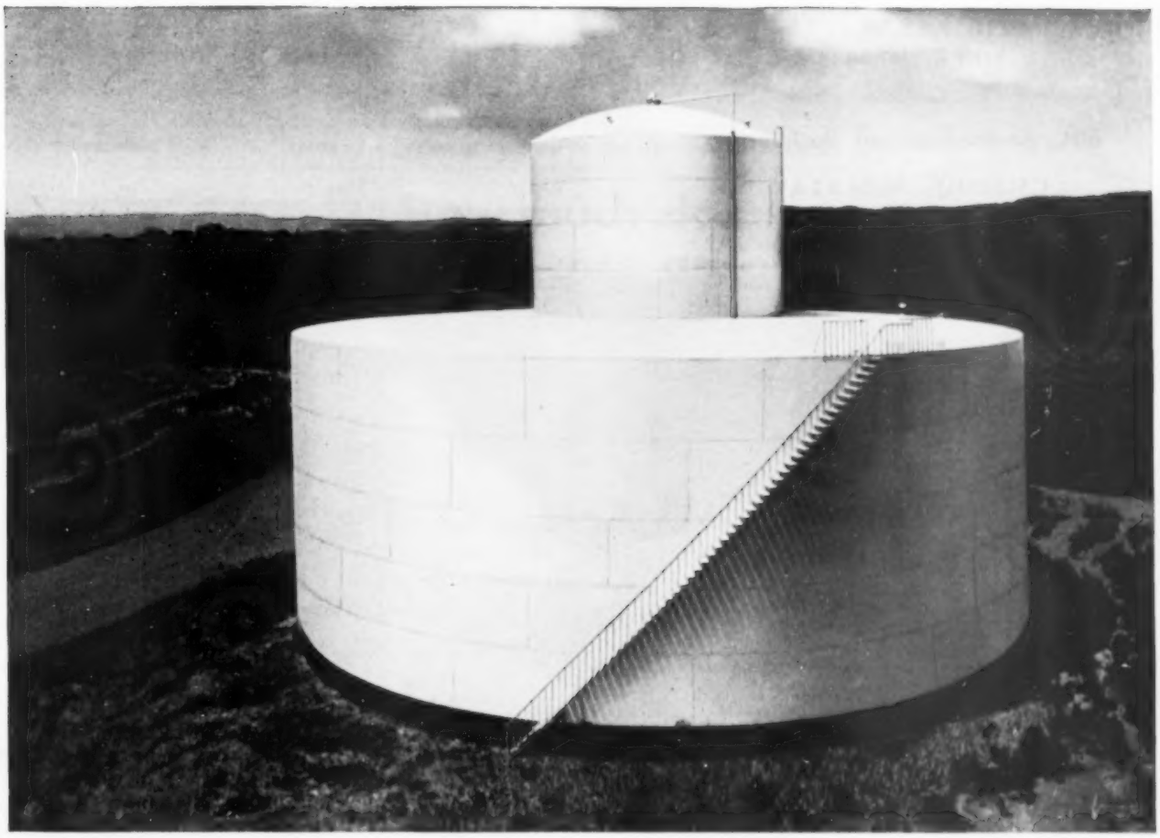




***the* Graver Double-Deck Floating Roof Tank** floats directly on the liquid, preventing the formation of vapors. It is applicable alike to crude and product storage areas at refineries, pipeline terminals and large bulk installations.

GRAVER

CONSERVATION TANKS

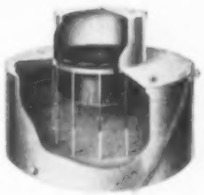


the thrifty VAPOR-MIZER

This revolutionary conservation design warrants your attention! The Vapor-Mizer not only uses less steel in building, but requires smaller, less expensive vapor lines in manifolded tankage.

With the Vapor-Mizer, standing losses are eliminated and filling losses are very much reduced...in addition, the fresh quality of your product is maintained.

The Vapor-Mizer is readily adaptable to converting existing tankage into fully effective conservation units. And since it operates at very low pressures (less than one ounce), the reinforcement of manifolded tanks becomes unnecessary. Look into the many economies offered by the Graver Vapor-Mizer!



THE VAPOR-MIZER

- Eliminates standing losses... minimizes filling losses
- Requires less steel to build
- Readily converts older, existing tankage

GRAVER TANK & MFG. CO., INC.

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601, Leeson-Lineham Building,

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MONARCH OILS LIMITED

601, Leeson-Lineham Building,

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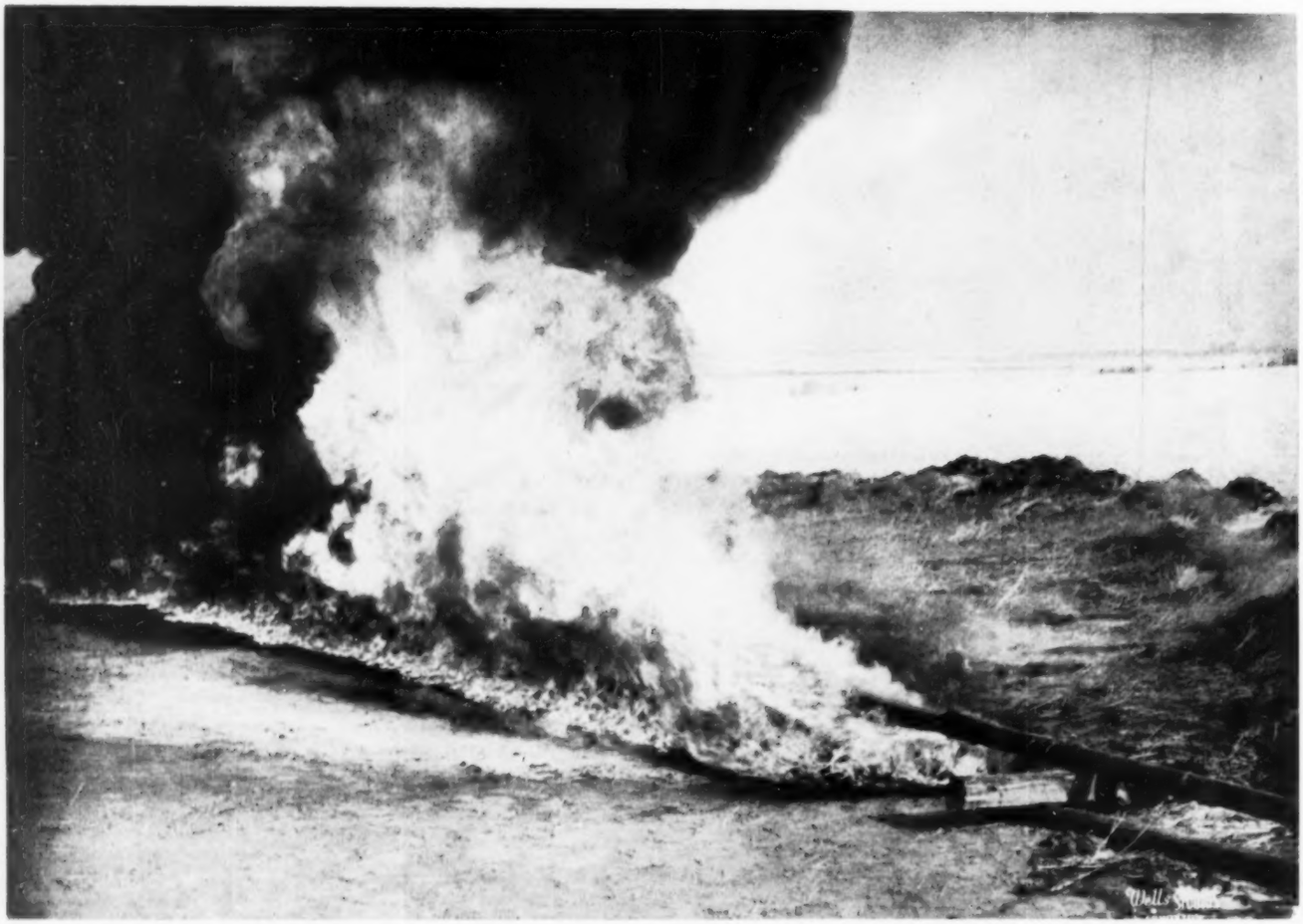


Century-Melton-Monarch-Acheson No. 1 well coming into production; the largest Basal Cretaceous producer ever completed in the entire history of the Canadian oil industry. Initial potential of 88 barrels per hour of clean 38 gravity oil was established.

The well is an important north-eastern extension of the highly prolific Acheson field, which is approximately six miles west of Edmonton.

This Century-Monarch success, located on a 320-acre Imperial Oil-Cal. Standard farmout, will be followed by complete development of this substantial holding down to and including the D3 (Devonian Reef) zone.

PETROLEUM CHEMICALS DIVISION

NEWS

November ★ One of a Series of Interest to the Petroleum Industry ★ 1953

When the customer says

"WHY CHANGE OIL?"

This new Du Pont folder will help your dealers to have a ready answer

The need for oil change at regular intervals has been frequently attacked in the public press. As a result, many motorists resist the service station operators' efforts to protect their cars with regular oil changes.

To help your dealers cope with this situation, Du Pont has prepared a small folder on the main reasons for changing crankcase oil. The copy is short, snappy, and easy to remember. Each point is clearly illustrated by a cartoon drawing.

For sample copies and information on how to obtain the folders for your dealers, write to any Du Pont Petroleum Chemicals Division district office. The title is "When the customer says *'Why Change Oil?'* "

How much do price and credit influence gasoline buying?

Du Pont's 4th survey report on consumer gasoline buying habits indicates motorists are not as price conscious as previously believed

Do "price wars" have any justification? Are credit cards business getters? Do local charge accounts build station or dealer loyalty?

Some of your customers have told us their answers to these important questions. And what they say may have a vital bearing on your future marketing plans. To help marketers solve the riddle of the dollar sign, the Du Pont Petroleum Chemicals Division is now distributing Report No. 4 of its nationwide survey of consumer gasoline buying habits.

THE INFLUENCE OF PRICE, credit cards and charge accounts on gasoline purchasing patterns is analyzed in the 4th report in Du Pont's continuing series.

Cartoon Storyboard for Showing Survey Data at Dealer Meetings

Buying habit statistics are an important ingredient in any sound marketing program. But at a dealer meeting, plain statistics are likely to cause an epidemic of sleeping sickness.

To help you present – graphically and entertainingly – the basic marketing information in the Du Pont Buying Habit Survey, we will be glad to prepare for you a rough cartoon-style storyboard. This can be easily made into an entertaining sound slide film.

The storyboard weaves the factual survey data into a cartoon-style chain of events involving the relationship between dealer and customer. Key facts are put in terms of the dealer's own yardstick of personal experience. And the script is tailored to fit your own brand and individual marketing problems.

Several oil companies are already using sound slide films made from Du Pont-prepared storyboards. They are highly enthusiastic about the results obtained.

The average motorist, the survey found, is well informed on gasoline prices and the price difference between grades. In fact, three out of four said the price they paid for gasoline was generally the same as for competing brands. (And prices reported in the survey agreed with posted prices in the areas studied.)

"PRICE WARS"

It may surprise some marketing executives to learn that few of the motorists interviewed even recall "price wars." And still fewer switched brands or stations to take advantage of such drastically reduced prices.

And price is no deterrent in the sale

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

PETROLEUM CHEMICALS DIVISION
NEWS

CONTINUED *Price and Credit*

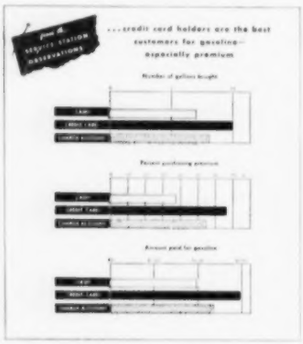
of the better grade of gasoline. Moreover, the frequency of premium purchase is greatest in areas where higher premium prices prevail.

CREDIT CARDS

The survey shows that 12% of the motorists in the U. S. hold oil company credit cards. But the percentage varies widely in different geographic areas. In the West, for example, nearly 30% hold credit cards. Service station observations show that the possession of a credit card practically assures that it will be used—and used regularly.

Good credit generally denotes a good customer. And this holds true in gasoline marketing as well as in any other business.

Credit cards are used most extensively by the upper income groups, and more than half the credit card holders say they use the card for services and products other than gasoline. Credit card holders are, therefore, in most cases, "best" customers.



THESE CHARTS from Report No. 4 of "The Service Station and the Motorist," based on actual service station observations, show that credit card holders are the "best" gasoline customers.

CHARGE ACCOUNTS

Almost 27% of the motorists interviewed said they have a charge account at a local service station. Point-of-purchase observations show that 14% of gasoline purchases are by charge account.

In contrast to credit cards, charge accounts are largely a personal arrangement between an individual dealer and his customers. And, independent of brand loyalty, a dealer's personal friendship with his customers generally determines the amount of his charge account business.

QUALITY FACTOR

Only about 10% of the total gasoline market are "price buyers." However, the number of motorists who buy premium because they associate high price with high quality is almost as great.

National in scope, the Du Pont survey is based on 3,100 household interviews and 21,000 observations at 1,193 service stations. The previous three reports covered service station selection and loyalty, brand name recognition and loyalty, and gasoline grade preferences. Future reports will deal with oil and TBA purchases and dealer services.

The information made available to the oil industry through this survey, we believe, will be extremely useful in planning merchandising and promotion programs.

Eastern District Assistant Manager

BARRY V. CORNWALL

BARRY V. CORNWALL, now assistant manager for the Eastern district, joined the Petroleum Chemicals Division in 1952 as technical assistant to the director of sales.

He has been associated with the Du Pont Company since 1929. His first assignment was as a technician in the service laboratory of the Dyestuffs Division. He later became a salesman for anti-freeze and industrial solvents in the Alcohol Division.

Prior to his transfer to the Petroleum Chemicals Division, Mr. Cornwall was assistant sales manager of the Alcohol and Camphor Section.

Born in Winnipeg, Canada, he graduated from Clemson College. During World War II, he served four years in the U. S. Army.

Storage Tests Recommended For Fuel Oil Additive No. 2

If you have been trying to determine the effectiveness of Fuel Oil Additive No. 2 in your own stocks by an accelerated method, you may have been discouraged by the results.

For a true indication of the effectiveness of Du Pont Fuel Oil Additive No. 2, you cannot depend entirely on accelerated tests. *Storage* tests at temperatures approximating field conditions should be used whenever possible.

However, if actual storage tests take too long to be practical for your purposes, storage tests at a temperature of 110°F. is a good compromise. This accelerates aging enough to give comparisons in a few weeks. But the temperature isn't high enough to invalidate test results.

Samples of Fuel Oil Additive No. 2 for testing are available from any Du Pont Petroleum Chemicals Division district office.

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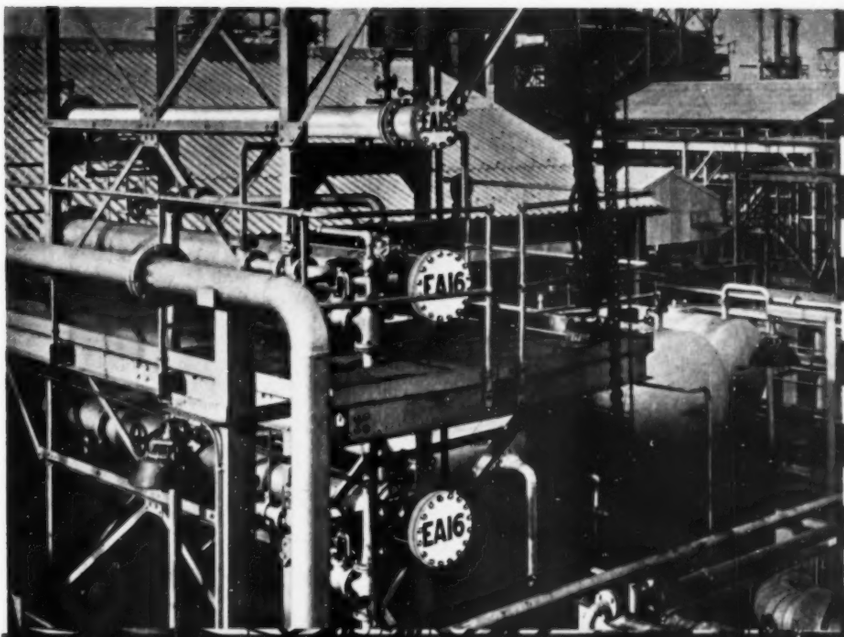
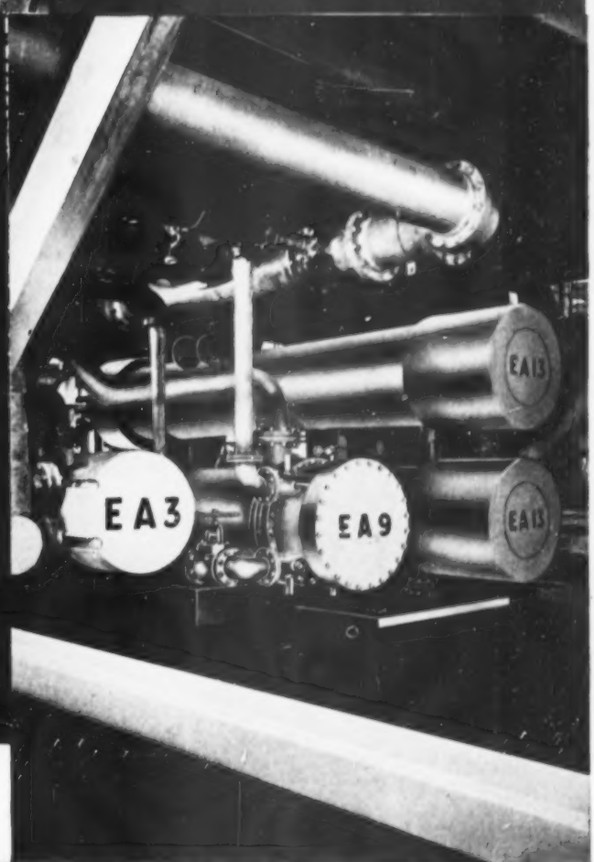
WHESSOE

Some of the Lummus-designed heat exchangers manufactured by Whessoe for the Reformer Unit at Shell's Stanlow Refinery, Ellesmere Port, Cheshire, are illustrated. The photograph shows a Gland Seal Oil Cooler and two Fresh Water Jacket Coolers, a Debutanizer Condenser and two Gasoline Condensers, a Debutanizer Heat Exchanger, Debutanizer Cooler and two Gasoline Exchangers.





Whessoe Limited are licensed by the Lummus Company to build heat exchangers to their designs and ratings.

WHESSOE LIMITED

DARLINGTON · ENGLAND

London Office: 25 Victoria Street, S.W.1

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we have never owned an oil well

Certainly oil production is indispensable to our business, nevertheless, Universal has never owned an oil well . . . . never produced any oil . . . never commercially refined, transported or marketed any petroleum products.

Our business . . . . from its very infancy . . . . has been confined to the development and commercial application of petroleum refining facilities . . . . the methods and techniques that have permitted the petroleum refiner

to produce maximum quantities of quality products to meet the demands of his markets.

That we have been successful in this effort is best evidenced by the hundreds of processing units designed by our company, and which are daily serving refineries all over the world.

Universal will never knowingly compete with a petroleum refiner in any phase of his production, refining or marketing business.

In our lifetime we could have acquired many oil wells and perhaps a refinery or two, but we've stuck to our task of helping the refiner . . . . giving him the kind of assistance that he must have if he is to realize a profitable return on his investment.

We Have Never Owned An Oil Well, is a fact that can be further emphasized by saying . . . . we never intend to. We simply won't compete with those we serve.

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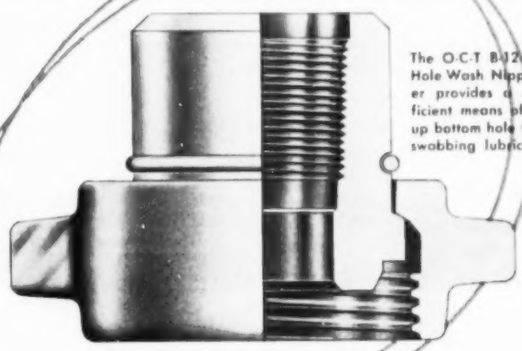
IT FITS

How's this for interchangeability!

If your bottom hole test and wire line truck is equipped with the O-C-T B-12-A Bottom Hole Wash Nipple Adapter, your connection problems are minimized. It will fit these fittings with no additional adapters.



The O-C-T B-12-A Bottom Hole Wash Nipple Adapter provides a quick, efficient means of hooking-up bottom hole tester and swabbing lubricators.

That's why 7 out of 10 operators select O-C-T fittings on their Xmas Trees

The best insurance you can get for quick, leak-proofed connections is to standardize on O-C-T for all your fittings. O-C-T has long recognized the extra economy that interchangeability of parts provides operators . . . and O-C-T has been a leader in establishing a new standard for flexibility in fittings. The result is that more operators now select O-C-T fittings than any other make. Check with your supply store. You'll be ahead if you specify O-C-T Crosses, Tees, and Chokes on your next Christmas Tree. Available through more than 700 supply store locations.

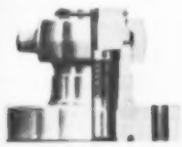
HERE

The O-C-T Type BC-14-A provides a combination threaded cross or tee and a bottom hole test adapter in one unit.

HERE

The O-C-T Type BT-14-A is a similar unit to the BC-14-A.

HERE

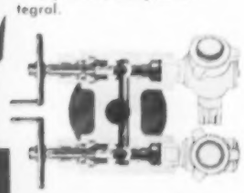


The O-C-T Type B-15-A Bottom Hole Test Adapter is designed for use where an integral flanged unit is preferred by the operator.

HERE

The O-C-T JE-1 Flow Control provides a single wing tree with the bottom hole pressure adapter integral.

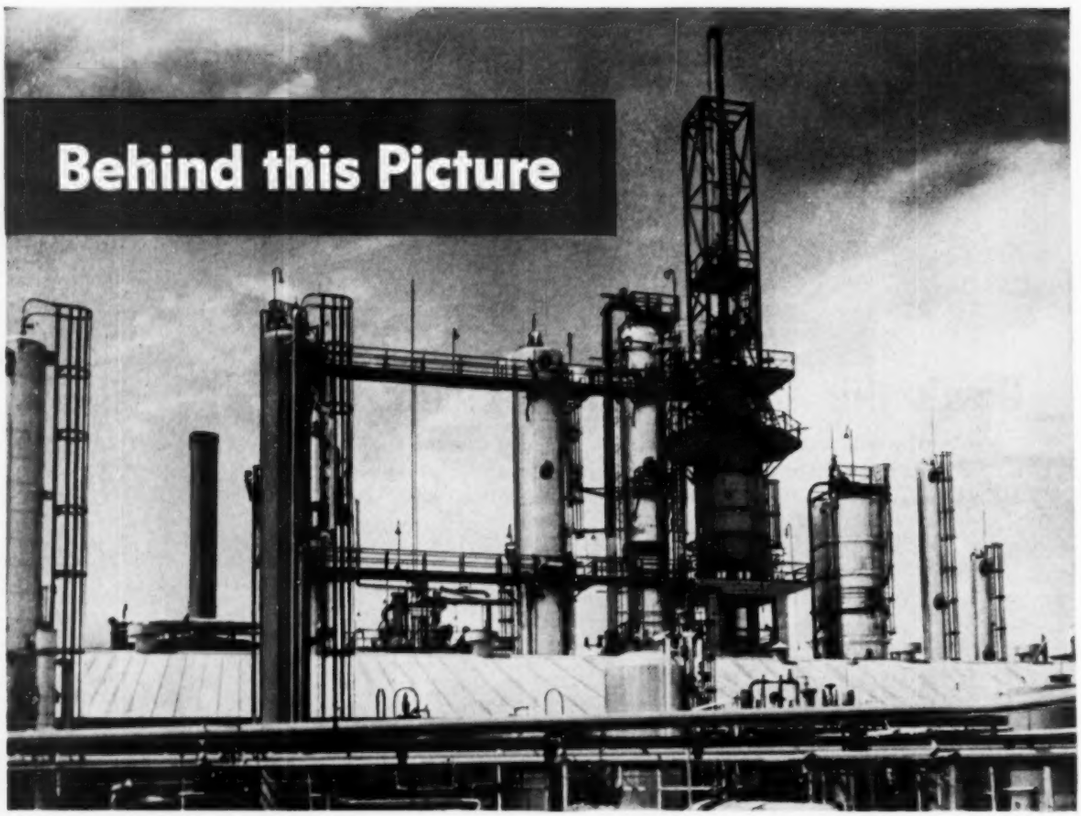
HERE



The O-C-T Dual Flow Control replaces 13 different fittings and makes it possible for the operator to switch the flow from one sized choke to another without closing in the well.

Oil Tester Tool Co. P. O. Box 3091 Houston 1, Texas

Export Representatives: Sterling Areas—Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston 1, Texas



. . . a New Concept in Refinery Design

Up there is part of the new refinery at Wrenshall, Minnesota that we designed and built for International Refineries, Inc. With a capacity of 11,000 B/D, the new plant produces gasolines, and a wide range of fuel oils for home and industry.

Ultra-modern Wrenshall features single-unit construction. Distillation, Model IV Fluid Catalytic Cracking, gas recovery, treating, and polymerization are all combined in a single unit. The plant is a model of integrated processing—balanced to meet the needs of the area it serves.

This unique design lends itself to continuous flow and automatic control—so you'll also find these at Wrenshall. From crude charge to end products, flow of oil is continuous, doing away with intermediate storage, pipes, pumps and tanks. And it takes just three men, at one centralized station, to completely control the processing of the entire refinery.

What does all this mean? To International, it means a very substantial reduction in initial investment and operating costs. To us, it means another in a long list of jobs where we worked out new answers—used creative imagination.

Perhaps we can be of help on *your* next project.

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World Petroleum

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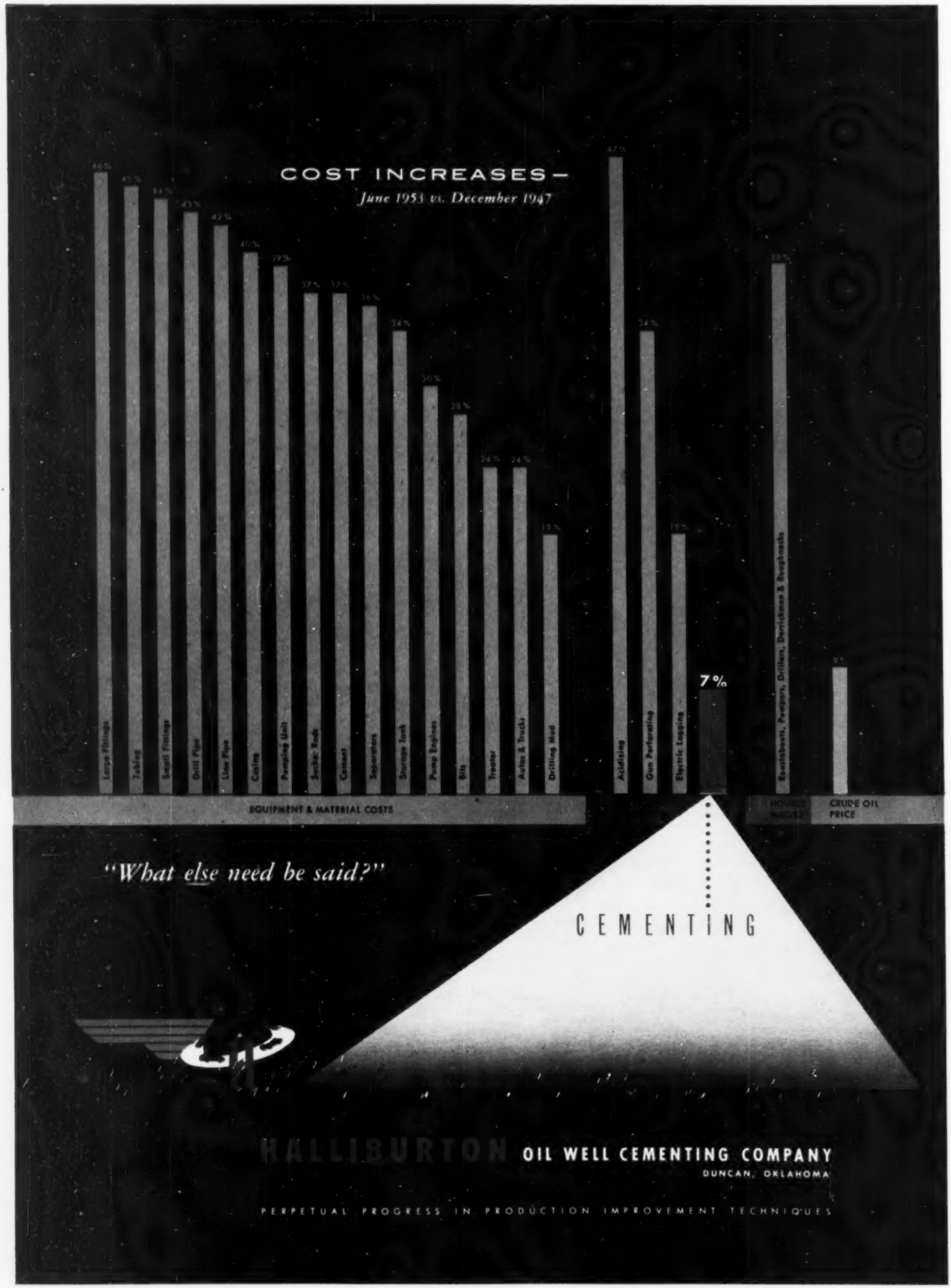
THIS MONTH'S COVER

Coat and wrap machine nearing end of pipe section on the new Trans Mountain pipe line near Red Pass, British Columbia. Kodachrome is by Richard Finnie of Bechtel Corp. and color plates are reproduced through the courtesy of A. M. Johnson, editor of the Standard Oil Co. of California *Bulletin*. An article describing installation of the Trans Mountain line begins on page 88 of this issue.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June 1953 vs. December 1947
46%
45%
44%
43%
42%
40%
39%
37%
37%
36%
34%
30%
28%
24%
24%
19%
42%
34%
19%
7%
39%
9%
Large Fittings
Tubing
Small Fittings
Drill Pipe
Line Pipe
Casing
Pumping Unit
Sucker Rods
Cement
Separators
Storage Tank
Pump Engines
Bits
Treater
Axles & Trucks
Drilling Mud
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IS THIS A TIME TO SING THE BLUES?

TO A DEGREE, the present state of opinion in the oil industry appears to reflect a triumph of psychology over statistics. Much of the comment heard among oil men and appearing in the press has forecast a difficult time ahead for petroleum. Supporters of this position cite the rise in stocks which at the end of September were 12 percent higher than on the corresponding date of 1952. Special significance is attached to the size of gasoline stocks (18.5 percent higher than a year before at the end of September) since that date is regarded as the end of the season of heavy demand for motor fuel. Crude stocks have been rising throughout the year, and at the end of the third quarter stood at 284,665,000 barrels, about eight percent higher than a year earlier and the largest since May 1952.

Undoubtedly the dark outlook foreseen in some quarters for petroleum has been stimulated to a degree by the pessimistic position taken by financial writers and some economists regarding the general business prospect, a judgment supported by the desultory course of the stock market. Such apprehension is somewhat difficult to explain in view of the high tide in business activity and the generally satisfactory earnings reports of most corporations. However, a long continued decline in security markets is generally regarded as presaging a drop in industrial activity.

Irrespective of the soundness of this observation as to general conditions, a survey of the statistical situation in the petroleum industry provides little ground for pessimism. From the angle of the petroleum marketer it is to be noted that demand for his products is at an all-time high. For the first three quarters of the year it has been over six percent above 1952, which set a high record up to that time.

While the volume of stocks of all liquid products on hand expressed in barrels has climbed to a top figure, the quantity, if measured in days' supply, reveals nothing alarming. At the current rate of demand it is sufficient for 85.5 days. Over the past ten years the amount of stocks on hand has averaged 91.7 days' supply, and rarely has it covered a shorter period than at present, measured by this standard of actual consumption.

Prices of both crude and major products have risen during the year. It is true that a continuation of the growth in stocks might lead to an unbalanced position threatening stability and possibly affecting the price level. There is evidence however, that remedial measures are being applied. The cut in allowables made by state regulatory bodies is an obvious step in this direction. During the third quarter there was a declining trend not only in production but also in runs to stills and in imports as compared with earlier months. It requires a little time to reverse an established trend and it is a truism in the trade that there is much more readiness to open valves than to close them. As a matter of fact, the refining branch of the industry has been operating under forced draft since 1950, has been running closer to capacity than was the case over previous years and the throughput has been higher than is likely to be long sustained with due allowance for operating efficiency and time spent in turn-arounds.

Chief concern among refiners relates to two principal products—gasoline and middle distillates. As to the former, a slowing down of business activity might slacken the rate of growth in consumption that has prevailed over recent years, but it would take a depression of cataclysmic proportions to cause a severe downturn in the volume of demand. As to requirements of middle distillates, specifically of fuel oil for domestic heating, the industry regularly engages in a yearly guessing match as to possible vagaries of the weather. A severe winter can quickly dissipate an apparently substantial surplus, while an unusually mild season can leave dealers with uncomfortably large stocks, but this is one of the risks that appears unavoidable. It is to be noted that the number of oil heating installations continues to expand at a substantial pace.

Past experience reveals that while the oil industry has experienced many ups and downs, the periods during which surpluses have been a problem have been few in number and of short duration.

Secretary pays tribute to oil industry

By Douglas McKay
Secretary of the Interior

ONLY A FEW WEEKS AGO I had my first chance to make an extensive trip through the oil fields of the Gulf Coast. I was impressed, of course, by the scope and variety and size of the petroleum industry there. I was equally impressed by the optimism and confidence of businessmen and others with whom I talked, especially those in the oil business.

But though I was impressed, I was not surprised. I have known that this was an industry in which operators were never content to rest on past records, were always anxious to expand.

I realize there has been a little restiveness within the industry lately, some fear that facilities may have been overexpanded. It is a fear that I cannot share. True enough, there have had to be readjustments. We could not really expect a continuance of the boom in industry that has been going full blast for the past 12 years. We are now in a period of shaking down to fundamentals again, reestablishing a sound foundation for a true prosperity. The petroleum industry is only one of many in which that shaking down has to take place.

We as a nation have, though, I am convinced, nothing to fear for the future, granted only that we can maintain the peace. I am an optimist, but not, I think, a foolish one. It's just that I have confidence in the basic integrity of our American people and in their refusal ever to quit working to make this a better world in which to live.

In many ways the petroleum industry demonstrates these very characteristics as in a model. The industry has made tremendous strides in improving its products and in developing new fields and new markets. It has made that progress through its own efforts and because it determined many years ago that it would remain independent, that it would solve its own problems on its own, striving always to give better service to its customers.

When the security of the nation was threatened in two world wars, leaders of the petroleum industry were among the first to offer their services to the government. They did not offer grudgingly and they did not seem to regard the offer as anything of a sacrifice. They simply believed that it was their patriotic duty to pitch in with their knowledge and their skill to help win through to victory.

In World War II, certainly, the Petroleum Administration for War contributed much to the ultimate triumph. Prodigious feats of production were accomplished by the hard-working, unselfish industry leaders who came to Washington at the first call for volunteers. Their service in the trying days of conflict already has gone down in history as a great achievement of American industry. I myself always have been impressed by what the Army-Navy Petroleum Board of the joint Chiefs of Staff said in summary of the PAW-industry efforts during the war: ". . . at no time did the services lack for oil in the proper quantities, of the proper kinds and at the proper places. No government agency and no branch of American industry achieved a prouder war record."

When the Communists invaded South Korea, again came a call for men willing to put aside their own affairs to help strengthen America's defense.

Under the leadership of Bruce Brown and with the help of many who had served in PAW, a brilliant staff was assembled to get the Petroleum Administration for Defense under way. Every branch of the industry sent its best men to Washington to do the gigantic job that was needed.

Between the two wars, a startling revolution had come about in the uses and requirements of petroleum and petroleum products. New skills, new techniques and greater quantities of every product were needed if we were to succeed in the battle.

Military demands for aviation gasoline were tremendous, for new and more deadly war tools were being used. It was essential that we should find more oil by drilling more wells, build more transportation facilities, expand our refining capacity.

Every one of the increased demands was met because the petroleum industry was accustomed to doing the impossible, without confusion and with a minimum of pulling and hauling.

There was never any hesitancy on the part of the industry on any phase of the defense program. When an expert was needed for a specialized job, he came. When a refiner was called on for additional production of some special product or other, like jet fuel, he delivered.

In other words, the petroleum industry demonstrated that it was willing to tackle and lick any assignment, no matter how big or how tough.

When I came to the Department last January, I found a fine organization under J. Ed Warren, who since has gone back to being an independent producer. New men had come into the organization to relieve the first echelon of shock troops. They did every bit as good a job as the first team.

Now, in what would seem to be the closing days of the PAD, Joseph A. La Fortune is doing still another fine job. It does not, perhaps, have the glamour of the hectic early days of the agency. But it calls for the same careful attention to the hundreds of details that must be checked and rechecked as we try to make an orderly transition from the defense agency to some form of peacetime program.

I have had a good opportunity to observe the work of the petroleum agency and to study the way the men who came to work for their government have operated. I can honestly say that there has never been a better example of government and industry cooperation than has been demonstrated in that agency.

There probably are still some problems ahead. There seem always to be problems. But I am confident that, so long as the close relationship between the petroleum industry and government that has been established continues, we shall solve them all.

Petroleum efficiency a product of competition

By Frank M. Porter

President American Petroleum Institute

THE STORY OF OIL is a story of tremendous industrial development, unexcelled by any group in the economic history of this country. It was not until after 1900 that extensive search for oil and gas was carried beyond the immediate areas of early development in Pennsylvania and West Virginia. Since that time, each annual report of the industry, with few exceptions, has reflected greater development activities than the preceding year. The growth of the American petroleum industry has been steady.

Oil and gas occupy dominant, competitive positions in the fuel markets. There is strong competition among oil, gas and coal. The reason for the competitive position of oil and gas in relation to coal and other fuels, however, goes much deeper than a mere struggle between competing fuels. The most potent force in the continuous increase in demand for oil and gas is the strong, vigorous competition within the industry itself. The quantity and quality of petroleum products that have been available to meet every requirement in peace or war is compelling evidence of the vigorous internal strength of the oil industry. An industry characterized by monopoly could not conceivably produce the raw material and the competing facilities that meet the ever-growing demand for better petroleum products at continued low price levels.

Nowadays, it is commonplace to find two, three or four competitive service stations on the corners of important highway intersections. Regardless of what lower price may be posted by any one of them, you can be assured that the others will meet it in a matter of hours or lose business. On the other hand, when it comes to increasing the price of gasoline, no retailer is willing to risk it unless he is convinced that the economic forces are such as to make the increase clearly justifiable and, therefore, likely to be followed by his competitors. Why this is so difficult for some people in government and in Congress to understand has always been somewhat of a mystery to me.

Throughout our cities and towns and along the highways, at the crossroads and the most inaccessible back roads where commercial establishments exist, you will find gasoline pumps or service stations ready to meet every demand, large or small, seven days a week the year 'round. There are about 340,000 retail outlets for gasoline, lubricants and fuel oils.

Within reaching distance of the consumer's telephone are motor fuels, heating and cooking fuels, heavy residuals for industrial uses, lubricating oils, waxes, greases and all other major petroleum products. A network of industrial facilities and proven petroleum reserves representing an investment in the order of thirty and a half billion dollars stands as a constant guarantee to the local retailer that he can continue to supply his customers at a moment's notice.

Backing up these 340,000 retail outlets are 30,000 bulk stations, terminals and other wholesalers of petroleum products and, according to the last count, over 300 operating refineries located in every principal consuming area of the country. The latter have a rated operating capacity of nearly seven and a half million barrels a day. In turn, these refineries and marketing facilities are served by more than 140,000 miles of crude oil trunk and gathering pipe lines, 27,000 miles of product lines, about 95,000 tank cars and 550 ocean-going tankers. In addition, large fleets of river barges, lake tankers and other inland vessels are used in the transportation of crude oil and products.

The foundation on which this great industrial structure rests is of course the known petroleum reserves of the United States. It is often asked: "Do we have sufficient petroleum reserves to meet all possible emergencies? In short, are we running out of oil?" The past is usually a reasonably accurate guide to the future. Since 1939 domestic production of crude oil and condensates has ranged from 1½ billion barrels a year to more than 2½ billion barrels in 1952. Yet, the known proved reserves of liquid petroleum have increased steadily from 18½ billion barrels in 1939 to almost 33 billion barrels as of December 31, 1952. Here again we have what appears to be an economic anomaly. The more oil we produce the larger our reserves grow. The answer to this is found in a simple equation: namely, more production equals additional income, which quickly develops fresh incentives and ability to search for and develop new oil reserves. The oil and gas industries present a perfect example of the truth that the freedom to produce our full requirements of all natural resources, so far as possible without waste, is the best way to insure the greatest quantity of the highest quality at the lowest prices.

A form of government that has preserved freedom for all; freedom to produce and compete for any of the fuel markets of the nation; freedom to carry on scientific research for the development of higher quality products; freedom to assume the responsibility of supplying the needs of the public and the government by developing a cushion of reserves with adequate and efficient transportation, refining and marketing facilities is, we must conclude, the basic reason for the competitive position of the oil industry. The same freedom, efficiency, and a like regard for public interest are accountable for the competitive position of the gas industry.

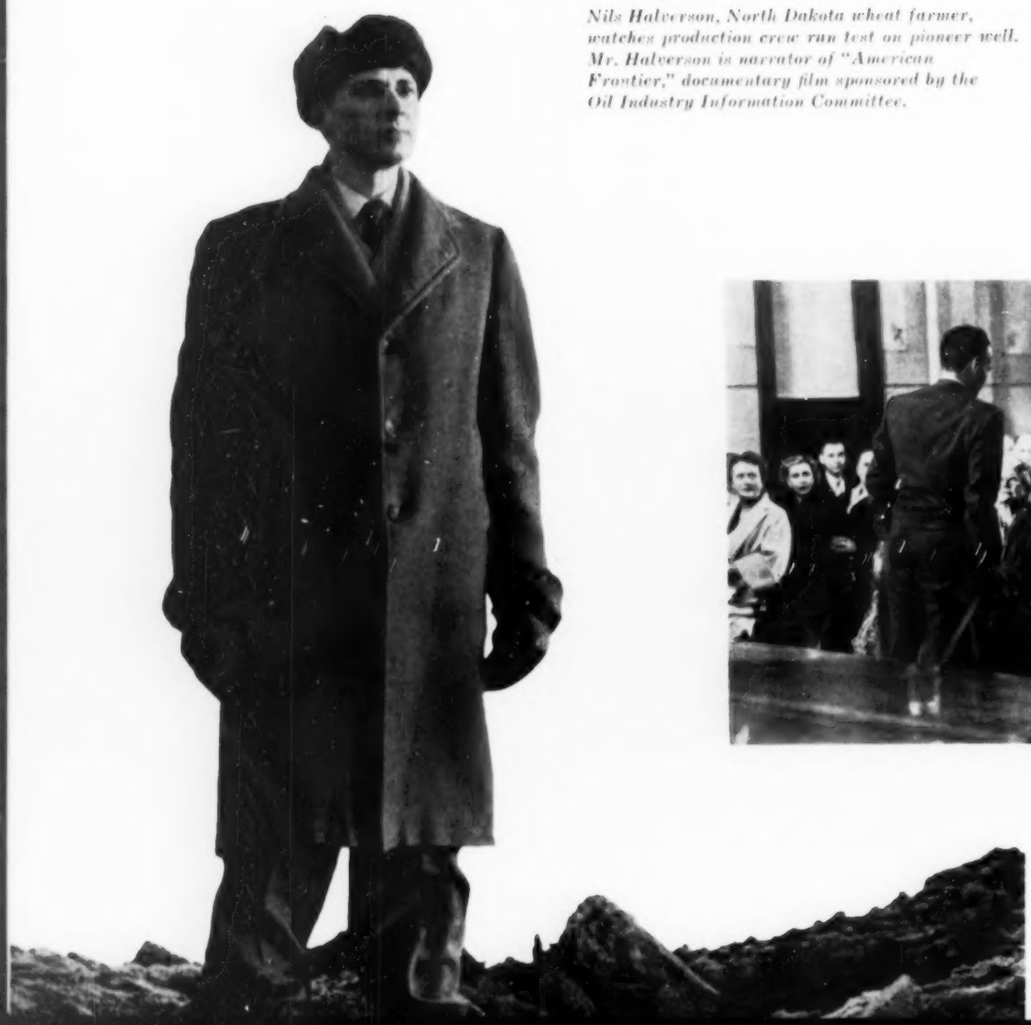
Perhaps another reason for the competitive position of petroleum in relation to other fuels is the strong competition that sometimes develops between products. One striking example is the competition between fuel oil and diesel fuels for railway transportation. Back of this competition is the never ending research of the petroleum scientists. It is axiomatic that, as our research progresses, we experience shifts in demand from one petroleum product to another, just as we have witnessed changes from coal to oil and from oil to gas. As science develops and perfects the gas turbine, we may very well find crude oil faced with the same competition that has overtaken coal, unless the petroleum scientist can find new and more efficient methods of utilization for crude oil at competitive cost.

Oil Progress Week Has Nationwide Celebration

WITHIN THE FEW YEARS marked by its observance, Oil Progress Week has become a national institution participated in each season by increasing numbers of oil men throughout the country, its events attracting ever wider attention from the general public.

Officially, Oil Progress Week in 1953 ran from October 11 through October 17, but in many communities there was no holding back the local committees in setting up arrangements. Many jumped the gun and staged observances up to a week in advance of the stated starting date. Rallies, speeches, parades, open houses, radio and television shows, luncheons, dinners and other special events were held by the hundreds. Enthusiasm among oil men ran high, and led members of the Oil Industry Information Committee of the American Petroleum Institute, which sponsors the annual observance, to feel that a tremendous impact had been made upon the public.

Oil Progress Week is something unique in American industry. This year's observance was the sixth, and was by far the most impressive. Throughout this seven-day period the domestic oil industry



Nils Halverson, North Dakota wheat farmer, watches production crew run test on pioneer well. Mr. Halverson is narrator of "American Frontier," documentary film sponsored by the Oil Industry Information Committee.

Scene from "American Frontier," OIIC film, shows oil company official addressing citizens of Williston, North Dakota.

At left, using an oil barrel for a desk at wellsite on capital grounds, Governor Johnston Murray of Oklahoma signs a proclamation officially designating Oil Progress Week. At right, Governor Edward Arn of Kansas signs a proclamation for Oil Progress Week as four members of the OHC look on.

literally and figuratively turned itself inside-out in its effort to give the general public a firmer understanding of this business which has such a vital effect on their lives. This year's theme was conservation, and "Oil — At Your Service" was the slogan.

The Institute's newest motion picture, "American Frontier," made its debut at the beginning of Oil Progress Week, and received high praise everywhere it was shown. This dramatic documentary tells the epic story of the discovery of oil in the Williston Basin of North Dakota. Filmed on the scene, it is authentic to the last detail. The fast-moving script captures the imagination and graphically illustrates the difficulties of finding oil in a new area.

As in previous years, the industry's top executives were among the thousands of oil men making speeches and participating in special events during Oil Progress Week. They included Frank M. Porter, president of the American Petroleum Institute; P. C. Spencer, president of Sinclair Oil Co.; Bruce K. Brown, president of Pan-American Oil Corp.; Dr. Robert Wilson, chairman of the Board of Standard Oil Company (Indiana); W. K. Whiteford, president of Gulf Oil Corp.; L. F. McCollum, president of Continental Oil Co.; B. Brewster Jennings, president of Socony-Vacuum Oil Co.; R. L. Minckler, president of General Petroleum Co.; Millard K. Neptune, president of Platte Pipe Line Co., and many others.

State governors, including Governors Arn of Kansas, Langlie of Washington, Murray of Oklahoma and others also spoke up for the domestic oil industry. Secretary of the Interior McKay, with members of his staff, joined Louisiana oil men and state officials in a pre-Oil Progress Week observance on October 7 and 8. The occasion was the dedication of a new oil center at Lafayette, Louisiana.

Some industry leaders filled as many as three or four speaking engagements in the same week, to different audiences hundreds of miles apart.

Celebration of oil progress week started a week ahead of time in the New York-New Jersey district when H. B. Miller, director of information, American Petroleum Institute, addressed 300 Rotarians in Atlantic City on October 6, and L. T. White, Cities Service Petroleum, Inc., appeared before the Trenton Chamber of Commerce on October 9. In Rochester, 400 dealers opened the week's celebration with a rally and heard Edwin H. Collins of Esso Standard Oil Company speak on "OHC and The Dealer."

An outstanding event in the eastern area was the luncheon meeting for community leaders at the Waldorf-Astoria Hotel, New York, on October 13. Presidents and other top executives of 50 oil companies were seated on the dais. The principal speaker was B. Brewster Jennings, president of Socony-Vacuum Oil Co. In recognition of New York City's 300th anniversary, the theme chosen for the luncheon was the contribution of the oil industry to the city's progress and prosperity.

In Newark, New Jersey's Oil Progress Week observance was highlighted by a beauty contest for the selection of an Oil Progress Queen, a parade of oil company vehicles, floats and bands and a luncheon at which E. W. Endter, president of the California Oil Company, spoke.

School essay contests, open houses, displays and exhibits, speakers and film showings before service clubs and other

Dakota farm scene in the dust bowl period before the oil men came. Reproduced from the film "American Frontier."

On location in North Dakota's Williston Basin, cameramen prepare to "shoot" scene of drilling operations at pioneer well. From OHC's film "American Frontier."

Left, Stanton K. Smith, 1953 OIIC chairman. Right, G. Stewart Brown, OIIC chairman designate for 1954.

organizations, radio interviews and spot announcements were among the activities carried out by local committees in New York and New Jersey.

Hundreds of special programs and events were arranged by 3,000 oilmen in the Middle Atlantic OIIC district. One big highlight was an oil progress parade in Norfolk, Portsmouth, and South Norfolk, Va., which was witnessed by 100,000 persons.

Again this year in Philadelphia, a large street banner hung over South Broad Street in the downtown section. It carried the words "Philadelphia's Progress and Oil's Progress Go Hand in Hand — Oil Progress Week—October 11-17." In addition, an elaborate display appeared in the main office of the Pennsylvania Company, the state's second largest bank. Afterwards, the exhibit was to be rotated in 12 of the bank's branches throughout the city for a period of two weeks each. The exhibit includes a model derrick, a model catalytic cracker and other interesting petroleum items.

For the first time, an OPW banquet was held in Philadelphia at the Bellevue-Stratford Hotel for 1,000 oilmen and their guests. The principal address was delivered by Frank M. Porter, president of the American Petroleum Institute. On the following day, Dr. Robert E. Wilson, chairman of the board, Standard Oil Company (Indiana), addressed 600 members of the Philadelphia Rotary Club at a luncheon. Following this, Dr. Wilson traveled to Harrisburg, Pa., where he addressed over 500 at a community leader event in the capital city of the Keystone State.

In Washington, D. C., a dinner for 650 was held in the Statler Hotel. In Pittsburgh, in addition to the fourth annual Oil Progress Week dinner at the William Penn Hotel, the new "Magic Barrel" demonstration was presented to the Sales Executives Club and two other civic groups there. A large street banner also hung in central Pittsburgh.

It is estimated that special Oil Progress Week events took place this year in well over 500 communities throughout the Middle Atlantic district. In addition more than 100 official OPW proclamations were issued this year in the Middle Atlantic district by governors, mayors, commissioners, burgesses, and other public officials.

In Raleigh, North Carolina, a tie-in banquet with the Kitty Hawk anniversary celebration was staged by the North Carolina State OIIC. Fifty oilmen were hosts to 350 selected guests. Governor Umstead and Mayor Wheeler of Raleigh spoke. Eastern Airlines' Vice President Robert Ramspeck was the principal speaker. His subject was "Fifty Years of Powered Flight."

OIIC committeemen in Toledo, Ohio, conducted their third annual "Oilman for a Day" program for 600 high school seniors. Their tour of oil refineries, terminals and other installations was followed by an essay contest. The winner from each school was awarded a defense bond. In Lima, Ohio's Oil Progress Week luncheon for junior and senior high school teachers and principals presented a different twist to the luncheon idea. The program featured a review of the American Petroleum Institute school series which has been in operation for three years in this location and a presentation of the oil conservation theme.

Cincinnati oilmen bypassed their large-scale civic luncheon of six years' standing to give emphasis to reaching broadside all civic and professional clubs within the Hamilton County area.

Dealers in Corbin, Kentucky, helped the local observance of Oil Progress Week by contributing a portion of their profits during one day's operation to a local hospital fund drive. Civic leaders and businessmen worked at the stations during this day.

"Miss Oil Progress," a model dressed entirely in petroleum products, made at least 20 appearances in the Kansas City area before women's groups, civic organizations and on radio and television. When presented, she described her clothing and explained the meaning of Oil Progress Week, a procedure which will be repeated with all groups before which she appears. A half-hour television film based upon the impact of the oil industry on Kansas City and illustrating all phases of the industry was produced by the local OIIC committee and shown over five television stations in the area.

In the twin cities of Minneapolis and St. Paul, more than 700 dealers of both large and independent companies greeted each customer during Oil Progress Week by handing them a card which contained a short statement on their position in the industry. Close to 270,000 cards were ordered and distributed during Oil Progress Week.

In Wichita, Kansas, Miss Oil Progress was crowned at a coronation ball with 3,000 persons in attendance. Miss Oil Progress reigned throughout the week and made numerous civic club appearances dressed in clothing made from petroleum products.

In Tulsa, Oklahoma, 500 service stations were decorated with large balloons overhead proclaiming Oil Progress Week slogans. The Tulsa Chamber of Commerce distributed 30,000 copies of its "Oil Capital of the World." Governors of both Kansas and Oklahoma issued proclamations

OUR CONSERVATION KEY
OIL
Con-Serves for You
THE LEAST WASTEFUL WITHDRAWAL OF NEEDED OIL
THE GREATEST POSSIBLE USE OF EVERY GALLON
DRUM UP BETTER BUSINESS

Posters designed for Oil Progress Week emphasizing conservation theme.

for celebrations in their individual states.

Commercial theaters showed OIIC movies in Wichita, El Dorado, Topeka and Emporia, Kans.; in Tulsa, Ponca City, Duncan, Sapulpa, Nowata, Miami, Hominy, Pawhuska and McAlester, Okla. and at many other points throughout the mid-continent.

In Denver, Colo., the Chamber of Commerce sponsored a luncheon which was addressed by Robert W. Bartlett, vice president general sales, Gulf Oil Corporation, API vice president for the division of marketing. His subject was "Oil People —At Your Service." Mr. Bartlett also made addresses at Salt Lake City and Casper, Wyo. Millard K. Neptune, president, Platte Pipe Line Company, addressed 200 persons at a luncheon in Cheyenne, Wyo.

In Colorado, Idaho, Montana, Utah and Wyoming, service stations vied with their displays for an all-expense-paid trip for two persons to the Rose Bowl football game at Pasadena, California on Jan. 1.

Interest in the decoration contest idea ran high, and entries came in from 60 communities where local OIIC's aggressively promoted it. The contest was co-sponsored by the regional oil dealer publications.

In the southwest, from the Panhandle to the Rio Grande Valley in Texas, OIIC community chairmen devised new events to highlight their Oil Progress Week observance.

One of the special events was a CavOILcade boat parade in Port Arthur. This event shaped up as one of the most colorful and unique ever to be staged in southeast Texas. In the Beaumont-Port Arthur area, features included a 35-ton oil well drilling rig which went into action each night at the South Texas State Fair.

Pampa led the Panhandle area celebration with a full week of events including a parade, barbecue, beauty contest, speeches and movies, with a banquet as the week's wind-up. Nocona arranged tours for the public to view a well in the process of being drilled and to observe oil field operations. Among the many other events was the Queen's coronation ball on October 15.

Houston, celebrating its third year of cooperation with the Chamber of Commerce on Oil Progress Week activities, saw dealers stage a contest with 200,000 persons participating.

In West Texas, an oil show was held at San Angelo on October 15, 16 and 17. In addition, there were displays and exhibits and daily radio and television shows. Another feature at San Angelo was the Boy Scout program, where some 3,500 scouts in the Concho council designated October as Oil Progress Month.

Dallas, Fort Worth, Longview, Midland and El Paso, among major towns and cities in Texas, scheduled special newspaper editions, movies and proclamations to tell the story of progress of the oil industry to their communities. Emphasis was placed on the 1953 conservation theme and the benefit future generations will derive from preservation of petroleum supplies.

For the visit of President Eisenhower to New Orleans on October 17 in connection with the Louisiana Sesquicentennial, approximately 200 service stations were decked out in decorations both patriotic and relative to Oil Progress Week. As one feature, 30,000 key chains were distributed to customers.

Nearly 150 displays, from OIIC exhibits to models of oil fields and refineries, were used in stores, banks and hotels to bring to the thousands of persons in New Orleans the story of the industry. The Sesquicentennial celebration attracted nearly as many persons as visit the city during Mardi Gras.

The oil industry "Conservation" story was told during the week to 66 different high school assemblies throughout the Great Lakes district with a total estimated audience in excess of 50,000 students. The most popular single special event throughout this district was the "Oil Man For a Day" program. It is estimated that close to 150 such programs were conducted in various communities.

The Chicago Oil Men's Club saluted the 50th anniversary of powered flight and the oil industry simultaneously. Ralph S. Damon, president of Trans-World Airlines, Inc., was the speaker. Senator Dirksen of Illinois addressed the Chicago Desk and Derrick Club, and W. K. Whiteford, president of Gulf Oil Corporation, addressed the Chicago Executives' Club.

Stanton K. Smith, president of Smith Oil & Refining Co., is serving as National Chairman of the Oil Industry Information Committee during the current year. To fill this position in 1954, G. Stewart Brown, public relations director of Standard Oil Company of California, was unanimously elected at a recent meeting of the national committee which directs the public relations program of the American Petroleum Institute.

Vice chairmen elected to serve during the coming year are as follows: Richard Rollins, secretary, The Atlantic Refining Co., Philadelphia; W. R. Huber, general manager retail sales, Gulf Oil Corp., Pittsburgh; Douglas Campbell, public relations director, The Pure Oil Company, Chicago; and A. D. Eubank, division manager, Quaker State Oil & Refining Co., Kansas City. John S. Cooke of the American Petroleum Institute, New York, was re-elected secretary.

Petroleum's burden of taxation

THE UNITED STATES, with but 6.5 percent of the world's population, has 69 percent of the world's motor vehicles and 75 percent of all passenger cars in use in the world today. America is figuratively a nation on pneumatic wheels, with 31 times as many motor vehicles and 43 times as many passenger cars, population-wise, as the entire rest of the world.

Vehicle registration figures compiled this year show a ratio of one motor vehicle for every third man, woman or child in the United States, and one passenger car for every 3.6 members of the population. The ratio for the rest of the world is one motor vehicle per 94.3 people and one passenger car per 153.

What are the factors responsible for this?

A very important factor, of course, is America's high standard of living, which is both cause and effect of the mass production methods which have brought the automobile, as well as many other basic elements in the American way of life, within reach of the average family.

Another important factor is the comparatively low cost of motor fuel in this country, which has made possible the economic use of the family car on the highways of America.

In countries where car ownership is regarded as a mark of wealth, motor fuels have been taxed accordingly, and these excessive tax burdens in turn have tended further to restrict highway travel to the luxury class or to the absolutely essential needs of commerce. Certainly this level of taxation has discouraged the widespread use of the "family car" that has become a symbol of American life.

Americans traveling abroad are often shocked at the high cost of motor fuel. In terms of U.S. currency and U.S. measurement standards, they find that a gallon of regular gasoline now costs about 77 cents in Italy, 64 cents in France, 60 cents in Germany, 56 cents in Finland, 54 cents in Spain, 50 cents in England, 49 cents in Belgium, 43 cents in Denmark, and 38 cents in the Netherlands.

One has only to compare such gasoline prices with the present United States average price of 29.5 cents per gallon (including taxes) to understand why bicycles and carts continue as common modes of transportation in many countries abroad.

But the really significant aspect of these comparisons is the lesson to be learned by American lawmakers in a practical demonstration of the economic principle of diminishing returns.

Actually, the net price of gasoline in these countries, exclusive of taxes, differs very little from the net price in America. In Italy, for example, the purchase price of 77.4 cents per gallon includes 52 cents of import duty and other taxes, a 200 percent levy on a net retail price of slightly over 25 cents.

Similarly, the combined duty and taxes amount to 232 percent over the retail price in Spain, 189 percent in France, 143 percent or more in England, 127 percent in Belgium, 112 percent in Finland, 102 percent in the Netherlands. In most of these countries, the net price of regular grade gasoline, exclusive of duties and taxes, ranges from 16 to 26 cents per gallon.

While the American motorist is not confronted with any such tax surcharges as these, the two cents in federal tax and 5.5 cent average state tax which he pays on every gallon of gasoline represents a combined levy of about 34 percent of the net price, a "luxury" tax rate, to be sure, on a commodity which can hardly be considered a luxury item in America.

When one notes how highway user revenues in America have more than doubled during the past seven years, more than tripled in 17 years and more than quadrupled in 24 years, he may be inclined to attribute this largely to increased volume of highway traffic.

True, there has been a great increase in the number of cars on the roads, but during this period since 1929, while highway user revenues have undergone a four-fold increase, the total number of vehicle registrations has merely doubled. Accordingly, it is apparent that automotive tax rates have been increased sharply as well.

Just in the eight years since the close of World War II, there have been no less than 48 increases in state gasoline tax rates enacted in 37 states. These have boosted the average tax rate by 25 percent to its present level of 5.5 cents per gallon.

Add to this the fact that the nation's highway users, since 1951, have been paying a 33 percent higher federal tax on gasoline, now two cents per gallon, and you have today a combined average rate of 7.5 cents per gallon. This is 27 percent higher than the combined state average and federal tax rate of the war period.

Furthermore, there is continuing agitation for more and more increases in gasoline taxes at state level. With 45 state legislatures in session during 1953, a total of 55 bills were introduced in 23 states calling for higher rates, although only five of these were actually enacted, in California, Iowa, Maryland, Nebraska and Ohio. Two other states, Kansas and New Hampshire, adopted measures providing for increases to become effective if and when the present federal gasoline tax is repealed.

Meanwhile, the prospect of possible repeal of the 2-cent federal gasoline tax, which now costs the nation's highway users about $800 million a year, provides a ray of hope to the motorist in an otherwise forbidding picture.

Twenty-three of the state legislatures this year adopted resolutions formally urging Congress to repeal the federal gasoline tax and to withdraw entirely from this field of taxation.

The Governors' Conference of the Council of State Governments, composed of the chief executives of each of the 48 states, adopted resolutions condemning the federal gasoline tax at its last two annual meetings. A sub-committee appointed to represent these governors conferred with President Eisenhower soon after his inauguration to discuss problems of overlapping state and federal taxes in general and the motor fuel tax in particular.

In line with all this, the 83rd Congress, at the President's request, created the Commission on Intergovernmental Relations to study the entire problem of present duplicating functions, both fiscal and otherwise, of federal, state and local goverаments.

This commission, headed by Clarence E. Manion, former dean of the Notre Dame University Law School, is composed of 25 members, including five senators, five House members, four governors, and other leaders in the fields of business, education and government.

The taxation of gasoline, as a clear-cut example of overlapping federal, state and sometimes local taxing authority, appears certain to become one of the

major considerations of this commission.

While there is much opposition to the federal gasoline tax, not only from most state officials but from organizations such as the American Farm Bureau Federation, the National Grange, the American Automobile Association, the American Trucking Association, the American Petroleum Institute and from highway users generally, there are some who oppose its repeal.

Most opposition to repeal of this and other federal automotive excise taxes comes from those who fear that such action would bring an end to the federal highway aid program, but actually there is no historic relationship between the two. The first federal aid highway act was adopted in 1916, sixteen years before the present excise taxes were imposed. There is little reason to believe that federal highway aid would end if the excises were repealed.

These taxes, at the outset, were considered purely as general revenue measures during the depression. Dollar-wise, the total federal grants for highway aid over the years have amounted to slightly over $5.4 billion, less than a third of the grand total of $17.2 billion collected by the government from these taxes up to this year.

First levied as "temporary" revenue measures to meet a crisis in the depression, these excises were increased in 1940, 1941 and 1942 to raise additional revenue for the national defense emergency. When the Korean crisis developed, many of these taxes were again increased, effective November 1, 1951. The federal gasoline tax rate was then raised to two cents a gallon, and a similar levy on diesel fuel consumed in motor vehicles was added for the first time.

Of the more than $17 billion which these taxes had yielded by the end of 1952, nearly half of the amount had come from levies on petroleum products—about $7.3 billion from gasoline, over $1 billion from lubricating oil and about $15 million from the newly imposed tax on diesel fuel. The remainder came from similar excise levies on motor vehicles, parts, accessories, tires and tubes.

Bearing in mind that motor vehicle owners bear the brunt of financing the highway systems of their states, this responsibility of itself entails an enormous financial load for a single class of citizens to bear, without the added burden of a special disproportionate share of federal taxation.

Motorists and other highway users will pay an estimated $3¼ billion in state automotive taxes during 1953. This projected figure of $3,256,000,000 includes an estimated $2,066,000,000 in gasoline taxes and $1,190,000,000 in state motor license fees and special taxes on motor carriers.

The figure represents a conservative five percent increase over the 1952 total of $3,101,338,000, but is more than double the $1,615,999,000 collected in 1946, the first year of unrestricted highway travel following World War II.

It was in 1936 that total revenue from state highway user taxes in the United States passed the $1 billion mark for the first time. It passed the $2 billion level in 1948 and $3 billion in 1952.

This year the revenue from state gasoline taxes alone will exceed $2 billion for the first time, and with the highway-user share of the federal gasoline tax added, the total gasoline tax burden upon American motorists will be close to $3 billion.

Another interesting sidelight on the present highway tax picture is the fact that the $3¼ billion now being paid to the states in highway taxes amounts to more than was collected by all states from all tax revenue sources in any fiscal year up to 1937.

It is no mere figure of speech to say that America's superb system of highways is truly symbolic of "the American way." It has been American production methods which have put more than two-thirds of the world's motor vehicles in operation on our roads—roads which these vehicles in turn have largely financed.

The highway commerce thus made possible has added immeasurably to our standard of living, with no town or community too small to be included in this vast network of highway communication.

The private automobile, which the American standard of living has brought within reach of the average family, has opened a whole world of recreational activity and everyday convenience for the family group.

Highway taxes are a comparatively new form of taxation in America. It was not until after the turn of the century, as more and more "horseless carriages" began to appear, that vehicle registration and operators' licenses were first adopted as revenue measures to finance highway development. It was not until after World War I that gasoline taxes were first devised as an added source of state highway revenue.

The underlying purpose of these taxes from the beginning was to provide funds specifically for highway financing, but during the depression years, many states fell into the habit of raiding these funds to finance other functions of government. In some instances this practice has continued to the present day, much to the detriment of the highway systems involved.

Seeing that drastic action was necessary to overcome this injustice to highway taxpayers, twenty-four states have adopted constitutional provisions specifically dedicating highway revenues to highway use, and in four other states there is action now pending to provide such constitutional protection.

Those states which persist in the practice of diverting huge sums of highway revenue to the general fund, like New York, which has diverted more than $1 billion over a period of years, are obviously loading upon the motorist an undue share of the general cost of state government.

Indeed, even in some of the states where the full amount of such revenue is regularly applied to the highway system, the ever-mounting burden of automotive taxes is becoming oppressive. Too often the idea of highway planning is confused with mere highway spending, as highway programs, like other functions of government, fall into the pattern of "tax and tax and spend and spend."

These are some of the questions which should cause lawmakers today to pause and reflect: How far can this tax spiral go? At what point will the average motorist decide that the family car is a luxury which he can no longer afford to buy and maintain? How soon will we reach the point of diminishing returns, where large numbers of automobiles will be taxed off the highways? What would that mean to the national economy and way of life?

True, this point has not yet been reached. But with an official in one state now openly advocating a ten-cent per gallon state tax, with others talking of eight-cent per gallon state tax rates, with federal and sometimes local gasoline taxes super-imposed on these state taxes, it is time to ponder seriously the economic facts of life in the automotive tax field.

The reasonable-cost factor has been truly significant in the development of America's automotive age. It is no less important to the future of the family car as a convenience and near-necessity in our daily lives.

The lesson of Europe teaches that widespread use of automobiles can be severely hampered where excessive taxes boost gasoline costs to a level which the average man cannot afford to pay.

Gasoline taxes can indeed reach a point of diminishing returns. Motorists and members of the petroleum industry must be on guard to see that they do not reach that point in America.

PAD may be liquidated in 1954

WASHINGTON

EMERGENCY CAPACITY goals have been largely met, and with its job done, the PAD may be disbanded at the end of the fiscal year. The National Petroleum Council will continue as an advisory body to the Government.

Since October 1950, when the Petroleum Administration for Defense was created, the petroleum industry of the United States and of the whole free world has been subject to strict and sweeping controls exercised from Washington.

The basic aim of the controls was to urge the industry to expand as rapidly as possible in the face of the emergency stemming from the Korean war. New and larger military and civilian demands were to be met and a greater spare capacity all along the line was sought. To help out, two weapons were used by the PAD. One was to set expansion goals, including the million-barrel daily reserve target; the other was to claim steel and other materials for the industry so that it could build its needed plant.

The petroleum processing plant of the free world is now at least 30 percent larger than it was three years ago and producing reserves have been built substantially. Spare capacity is regarded as ample for the present and more is coming in as new facilities are completed. Thus the question arises: Is the defense emergency over?

Official view of the administration is stated in a letter to the National Petroleum Council at its meeting September 29 in Washington, signed by Hugh A. Stewart, director of the Oil and Gas Division of the Interior Department.

"It now appears," he wrote, "that the Petroleum Administration for Defense may not be needed subsequent to June 30, 1954.

"If no further crisis develops, this agency could properly be liquidated as soon as it has completed its emergency defense responsibilities. The long-range responsibilities and functions which still remain could be administered by a normal peacetime organization, such as the Oil and Gas Division. The division could take over the present relationship of the Petroleum Administration for Defense with the National Petroleum Council and, if desired by the Department of Defense, the Department of the Interior could re-establish a Military Petroleum Advisory Board on the same general basis as that organization functioned on in 1947-50."

A 19-man committee of the council is studying the request, and the prospects are it will report its findings at the December meeting of the council with the Secretary of the Interior, Douglas McKay. B. Brewster Jennings, president of Socony-Vacuum Oil Co., is chairman of the committee. Members include Max W. Ball, the first director of the OGD, who is a Washington oil and gas consultant; Bruce K. Brown, president of Pan-Am Southern Corp., New Orleans, who was the first deputy administrator of the PAD; J. Ed Warren, independent oil producer of Midland, Texas, who was the succeeding deputy administrator of PAD, and others. The Secretary of the Interior is the administrator of the agency.

If PAD is near its end, this is in keeping with the promises made when it came into being. Secretary of the Interior Oscar L. Chapman, since retired from the government, then avowed that the PAD "will continue to work until there is no longer any need for its services. Then, just as was true at the end of World War II, it will be disbanded." A second promise was that "it shall be my purpose as Petroleum Administrator to use the powers entrusted to me, as far as is humanly possible, in such a way as to leave at the end of this emergency the same competitive relationships among the units of the oil and gas industry as exist today."

The latter promise has been kept, the agency says, claiming there never was a sustained charge that the industry played favorites, although it had broad powers to do so. The first promise will be kept when the organization is brought to an end.

At this milestone, a quick review of the powers and deeds of the agency may be in order:

The task of obtaining steel and other materials for oil and gas, and then parceling them out to each of thousands of operators at regular periods, occupied half the energies of the agency. But the PAD had other jobs. Agency heads made plans and programs for wartime oil for Presidents Truman and Eisenhower, recommended hundreds of projects for rapid amortization for income tax purposes, set expansion targets, sponsored a voluntary agreement of first 19 and later 14 American oil companies on foreign supply, and another voluntary agreement on heating oil for New England, and issued many directives and four conservation orders.

Most members of the staff came from the petroleum industry itself. A total of at least 500 oil industry executives have served with the agency at one time or another, a large figure because of the 18-month rotation policy.

New problems came up to plague the agency and the industry almost from the start. Eight months after PAD began, the Iranian oil industry was halted, depriving the free world of 650,000 b/d of crude oil, of which some 500,000 b/d was turned into products at Abadan, Iran, the world's largest oil refinery. A year after that came a strike of both steel and oil workers which choked off most of the nation's steel supply for six weeks and shut down a third of the petroleum industry for about as long. The Justice Department's "cartel" suit, with its political implications, added to the problems. Price policies of the Office of Price Stabilization collided head-on at times with PAD's and the industry's efforts. Through it all, all demands for oil were met.

Presently, few of the original powers are being used. Of the four conservation orders, none is in effect today. One

By Joseph Huttlinger

to save tetraethyl lead, another to save alkylate for aviation gasoline and a third to slow down the number of new natural gas customers have been abolished. A fourth, also designed to save aviation alkylate, has been suspended until the end of this year, when it may be revoked. The Congress brought an end to the powers to allocate steel and other materials, except to direct defense projects, last June. The agency is down from a peak of 353 persons to less than 70, and the budget is down from $3 million a year to $447,000.

Extension goals come to an end for U.S. oil wells and for virtually all foreign expansion with the close of this year. They have been announced through 1954 and 1955 for U.S. refining capacity, oil and gas pipe lines, oil storage and alkylate capacity, but no shortages of steel are in sight to make the achievement of the targets difficult. A summary of the expansion job, which is yet to come from PAD officially, shows a striking growth, as detailed in a separate article in this issue.

Thus, from January 1950 to the end of this year, U.S. crude oil and natural gas liquids producing capacity will register a 32 percent advance to 8,500,000 b/d; foreign (free world) producing capacity will increase 47 percent to about 5,900,000 b/d; U.S. refining capacity will be up 21 percent to 8,100,000 b/d; and foreign still capacity will be up 29 percent to 5,300,000 b/d. Similarly, capacity of oil and gas pipe lines of oil storage and aviation gasoline will show a marked increase by the end of this year.

Joseph A. LaFortune, the present deputy administrator of the petroleum agency, can say that the oil plant of the U.S. and of the free world is large enough "to meet the initial impact of war and to allow time for an expansion in productive capacity required by a prolonged period of hostilities."

For those interested in statistics, the following account, an excerpt from the October report of the agency to Congress, furnishes a good summary of the activities of the agency during this period:

"Under the controlled materials plan, which terminated June 30, 1953, PAD had received and processed 7,025 applications to complete or construct petroleum or gas projects and 2,319 amendments. Of these, 6,349 original applications and 2,189 amendments were approved.

"Applications or amendments denied, canceled, deferred or returned without action totaled 806. A number of these deferments or cases returned without action were on applications received in the second quarter of 1953, for construction after July 1.

"The dollar value of the applications and amendments approved was, by industry categories, as follows:

Gas	$2,392,965,696
Refining	1,619,527,898
Supply and transportation	1,244,851,953
Natural gas processing	437,310,276
Marketing	25,895,588
Production	64,712,086
Total	$5,785,254,497

"As of August 28, 1953, PAD had received applications for accelerated tax amortization on oil and gas projects valued at $4,881,700,000. It had approved and recommended to DPA applications having a value of $3,849,688,000 for an average rapid amortization of 49 percent of their cost.

"It disallowed amortization on $96,410,000 of the cost and recommended denial of amortization on $451,698,000. Applications amounting to $353,171,000 were withdrawn, and at the end of August there were in process applications amounting to $130,733,000."

Within government as well as within industry, the PAD has won widespread respect. This respect, naturally, spreads out to the whole petroleum industry. Thus, Secretary of the Interior Douglas McKay said October 8 at Lafayette, La.:

"I have had a good opportunity to observe the work of the petroleum agency and to study the men who came to work for their government during the two emergencies. I can say there has never been a better example of government and industry cooperating than has been demonstrated by the petroleum people and I want to say here: 'well done and thank you.'

"There is one thing that sticks out in the record and one which I admire greatly. That is the day-to-day independence and determination that the industry people exhibited. A special cooperation developed between the oil and gas industry and the government. We were able to work harmoniously together, but we realized that without the persistent drive and special knowledge that the industry was contributing, the job would never have been done so quickly and so efficiently."

The Petroleum Administration for Defense may be near the end, but not so its close ally, the National Petroleum Council.

The council, composed of some 100 top oil and gas executives who advise the government, seems all but certain to go on as it has since it was created in 1946.

Secretary of the Interior Douglas McKay told the council's last meeting that he wants "a continuing organization in the hands of the industry" and that he wants the council to continue as is.

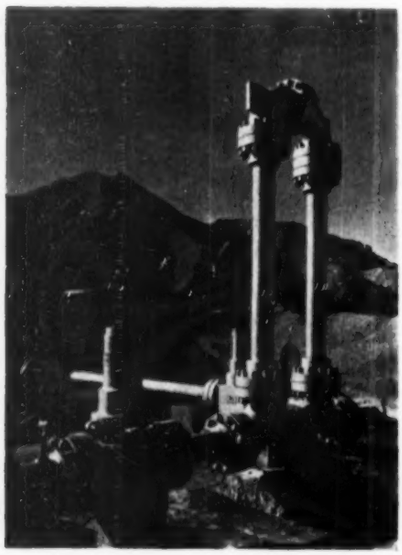
Joseph A. LaFortune, deputy administrator of the PAD, had this to say:

"Everyone in the industry, of course, knows about NPC. Everyone I know is agreed that it ought to continue just as it is now, an advisory committee of experts who are willing to tell the government what they know but are never willing to knuckle under to any dictation. As far as I'm concerned, this is close to an ideal arrangement. We have the government and industry cooperating, but we don't have the one or the other trying to run everything on its own."

Air view of the vast Abadan installation.

Iran Government discloses oil situation

Automatic flow-limit valve on high-pressure line in the Agha Jari field in southern Iran.



TEHERAN, IRAN

IN A REMARKABLY FRANK STATEMENT addressed to his fellow citizens, Deputy Premier Dolatabadi has explained the present situation of the Iranian oil industry and indicated the conditions essential to its restoration to productivity.

"Since it has been decided that the government should at the proper time inform the nation of the current state of affairs," said the statement, "the people are hereby informed of the report of the authorities of the National Iranian Oil Company.

"Until 1950, the year before the nationalization of the oil industry, the former company exported from Iran about 32 million tons of oil annually by means of more than 2,000 tankers. Of this total, about seven million tons were crude oil and the rest refined. On the date of the nationalization of the oil industry, March 21, 1951, the crude and refined oil reserves in the company tank farms amounted to 2,093,953 tons. From that date until October 1951, when the take-over was completed, the former company exported about 7.5 million tons of crude and refined oil the value of which was about 52 million pounds sterling ($145,600,000).

"At the time of the take-over the Abadan refinery was capable of processing 24 million tons of various products annually. After the take-over however, oil extraction and refining was reduced to something over one million tons a year, due to the lack of a market abroad. But if the oil problem is solved in a satisfactory manner, it would be possible to equip and prepare the plant to refine the original amount by acquiring spare parts, making necessary repairs, and changing some worn parts. These steps have been delayed during the past two years because of the lack of spare parts and the suspension of operation.

"Such an accomplishment necessitates an expenditure of 30 million to 40 million dollars for necessary parts and the employment of about 660 technicians. The Iranian workers of the oil company, by employing 30 experienced and expert technicians and spending about six million dollars for the replacement of necessary parts, would be able to extract nine million tons of crude oil and to refine from four million to six million tons of various oil products. Naturally, lowering of the extraction and refining of oil products to these quantities would result in unemployment for a great number of the company's staff and workers and would mean finding them jobs in other parts of the country.

"The lubricating oil plant was not in operation at the time of the take-over. Iranian engineers, however, started the plant operating though only after much difficulty. The plant has produced, to this date (Sept. 30), 800 tons of lubricating oil. Unfortunately, it has not been able to operate regularly due to the lack of necessary equipment. Stoppage was due primarily to lack of a single spare part, procurement of which from abroad used to be possible without the least difficulty. Manufacturers have refused to sell parts to Iran on political grounds.

"Hence, construction of spare parts has been necessary in the workshops of the company itself, and naturally operations had to stop until after their construction, which was not easy. So long as manufacturers are not ready to sell spare parts to the National Iranian Oil Company, the plant cannot be operated with confidence. Its capacity, should it operate continuously, is over 20,000 tons per annum. This amount would be sufficient for internal consumption.

"Abadan power station, with a capacity of over 90,000 kilowatts, is in operating condition at present and its capacity is more than the demand. However, the time for inspection of some of the generators has passed. This inspection should be undertaken by the manufacturing company's engineers, who would accept responsibility for it.

"A new 50,000-kilowatt power plant was

constructed in Abadan before the take-over. Part of the equipment of this plant has not arrived and consequently the plant is not in operation.

"The Masjud Sulaiman power station is worn out and is completely untrustworthy. The new station purchased from Switzerland cannot be used due to lack of some parts. In spite of repeated approaches by the national company, the manufacturing plant procrastinates and in effect refuses to sell the needed equipment.

"Since the date of take-over, oil products sold by the National Oil Company abroad have totaled 135,000 tons. Of this, some 120,000 tons were for export and 12,097 tons were to fuel the exporting tankers. The price of these sales was about $1,860,000. During that time up to June 30, 1953 the amount of oil products sold in Iran was 1,993,254 metric tons, at a value of 3,090,881,338 rials ($32,300,000). In the same period 26,000 tons of grease and lubricating oil were purchased from abroad at a cost of 140 million rials ($1,460,000).

"The National Iranian Oil Company owes 548,170,000 rials ($5,700,000) to the Ministry of Finance, and 2,209,000,000 rials ($23,000,000) to the National Bank of Iran for the deficit in its budget from the take-over date up to Sept. 22, 1953. Under present conditions, its monthly deficit is about 120 million rials ($1,250,000). The company's accounts and storage records, maintained by foreigners in the past, were transferred to an Iranian staff after the take-over when the foreign staff left Iran. In the past two years, the methods of the former company have been retained as much as possible. The data and information relating to its operation should be obtainable.

"A total of 3,604 foreign staff employees, 880 foreign workers, 6,237 Iranian staff employees and apprentices, and 50,670 Iranian workers and apprentices were employed in company installations before the take-over. At present the number of company employees (all of whom are Iranian except a score of foreigners) consists of 6,764 staff employees and apprentices and 48,748 workers and apprentices. To these figures should be added 3,234 temporary workers before the take-over and 751 temporary workers after the take-over. Thus the total number of staff and workers of the company before the take-over was 64,625 and at present it is 56,261.

"Another problem facing the company at present is transportation. A majority of the vehicles which should have been replaced annually is now worn out, because they were not replaced in the past two years and because no spare parts were obtained for the above reasons. If speedy action is not taken for their repair and replacement, the daily life of the company's employees, extraction and refining operations in Khuzistan, and internal distribution will face serious derangement.

"Orders have been given concerning a report on existing supplies of drugs, food, transport vehicles, building materials and spare parts. The necessary information should be obtainable from the company books in Khuzistan. When received, it will be submitted in a separate report.

"This, in brief, is the condition of the National Iranian Oil Company, which the present government has inherited from the former government. It deserves attention and regret. In conclusion, while appreciating and commending the noble and worthy feelings of the brave Iranian people, who made every sacrifice to achieve their individuality and to preserve their rights, the present government hopes to take effective steps, while taking fully into consideration the oil nationalization law and the fundamental aspirations of the Iranian nation, which stem from self-respect and national honor, for the operation of the said resources, which must be a source of benefit for workers and for making up past losses to some degree. Under present conditions, without the oil, a major part of our development plans will be impossible to carry out."

On the day following Deputy Dolatabadi's broadcast, the government issued the following statement:

"An extract of the NIOC"s report was made public yesterday and this was the second effective step taken by the government to inform the public of the bitter truth regarding the most important economic and financial source which exists in the country.

"This bitter truth was known to the experts from the beginning, but Mosadegh and his collaborators, who derived considerable advantage for their propaganda by keeping the people in the dark, would never have kept the public informed of real facts even if they had continued in office for another 100 years.

"Now that the truth is known, it presents a very sorrowful story for it shows how the previous government has treated the biggest source of the country's income, how the country has been deprived of its income and what a colossal debt has been created for the people, and it is not known how we are ever going to settle it.

"How can we tolerate the millions borrowed by the NIOC from the Bank Melli and the Ministry of Finance? Where shall we get the funds to pay these back? This debt is additional to what the previous government owed the Bank Melli. The bank has to make up for the NIOC budget deficit of rials 120,000,000 monthly.

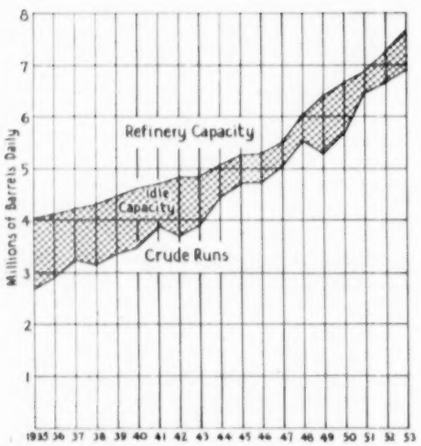
"We are of the opinion that the people must carefully study the figures supplied by the management of the NIOC who were appointed by Mosedegh himself and must think of a way out."

As stated by Deputy Dolatabadi, it is the apparent intention of the Zahedi administration to place before the Iranian people through a series of public addresses the actual state of the stalled petroleum industry. This presumably is regarded as a condition precedent to its restoration to some sort of a workable basis. For the present, however, the government has some immediate problems to wrestle with, including the maintenance of order, adjustment of the conflicting claims of rival factions, and establishment of a legislative body that can adopt necessary measures with some claim to legal authority. The nucleus of such a body is provided by the 23 members of the Majlis who refused to recognize the orders of Dr. Mossadegh in dissolving that branch of the legislature. The senators were removed before the dictatorial powers of Mossadegh had been challenged and the question of reestablishing this branch of the legislature is a knotty one.

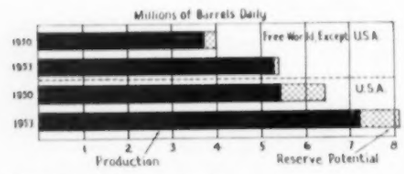
There is a natural reluctance to resort to a general election under existing conditions, as the occasion probably would be seized upon by the Tudeh party as an excuse for demonstrations. The financial obstacle to use of the funds advanced by the United States, due to the lack of native currency, has been relieved temporarily by a new issue of rials. The demands of tradesmen for a raise in the exchange value of the rial are still heard but the objection is that it would tend to cut down the export of native products. A serious burden is placed upon the Iranian oil administration, as pointed out by Deputy Dolatabadi, by the maintenance on the payroll of more than 56,000 native employees or nearly 90 percent of the full corps at the peak of operations under the British company. It is obvious that most of these have little or nothing to do considering the greatly reduced scale of operation, but to discharge those who are not needed would add to unemployment and might also lead to disturbances.

Behind the scenes there undoubtedly is active discussion going on of ways and means of getting the Iranian oil industry back into limited operation. Ambassador Henderson, who remains the only avenue of communication between the United States and Britain on the one hand and Iran on the other, is in frequent conference with top Iranian officials. It is reasonable to assume that he conveys any suggestions or proposals that may emanate from the American State Department or that may result from discussions between the representatives of Washington and London. So far as known, progress toward anything definite is slow, and it is likely to be a considerable time before any open move can be taken. The matter is of interest to Iran's neighbors, who must be consulted if they are to be asked to limit their own output to make room for Iran's oil and, as the statement issued by the government reveals, a great deal of rehabilitation is necessary before any substantial volume of oil can be put into distribution.

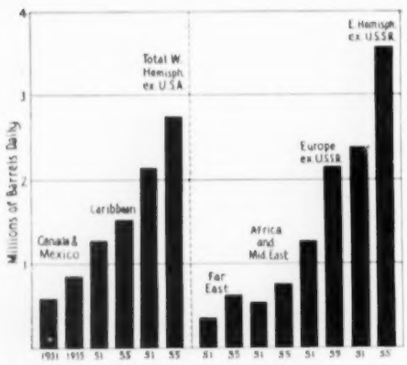
Free world oil rose 38 percent in four year period



Comparison of U. S. refinery capacity with crude runs to stills.



Crude producing capacity compared with production.



Growth of world refinery capacity outside U. S. A. and U. S. S. R.

By Joseph Huttlinger

THE PETROLEUM INDUSTRY of the free world has undergone the greatest expansion in its history during the past four years, since before the Korean war in 1950.

As a result, the free world (including the United States and areas such as Venezuela and the Middle East) is able as this year draws to a close to produce an estimated 38 percent more crude petroleum and natural gas liquids than at the start of 1950.

This advance, to a capacity of 14,400,000 barrels daily, compares with an availability of 10,450,000 at the start of 1950, but those figures do not tell the whole story. The 1950 production included 650,000 b/d from Iran, while current statistics do not include Iran, since its industry came to a shutdown in the middle of 1951 in a dispute with Great Britain.

A further gain is forecast for the coming year, so that at the start of 1955, a total worldwide crude oil and natural gas liquids capacity of nearly 15 million barrels daily is foreseen. The estimates come from a variety of sources, chiefly, however, the National Petroleum Council.

A substantial part of the capacity represents a spare or reserve. Thus, while United States oil fields are able to turn out 8,500,000 b/d at the close of this year, an actual production of only 7,300,000 b/d is forecast for December by the Bureau of Mines. This, then, provides the "million barrel reserve" which has been the goal of defense planners during the past few years. Few precise estimates are issued as to the ability of other producers to step up their output, but the upsurge in production during the past few years, from 3.7 to 5.2 million barrels daily between 1950 and 1953, is evidence of reserve power. The figures become even more significant when it is recalled that the gain has been made despite the loss of Iranian oil. While the crude oil productivity of the United States increased some 32 percent during the past four years, the reserve capacity is about the same, almost solely because demand likewise mounted. Thus, as with other phases of petroleum, the huge expansion now proves only enough to keep up with consumption.

Matching the crude oil showing is the refinery expansion over the past four years, which promises by the end of this year a daily capacity of 13,380,000 b/d, some 24 percent larger than the January 1950 capacity of 10,796,000 b/d. As with the crude oil expansion, the refinery growth is larger than the figures indicate because Iran is included in the 1950 report, but not in the latter one.

In continental United States, the four-year refinery expansion is 21 percent, from 6,696,000 b/d to 8,100,000 b/d. An even larger percentage increase took place elsewhere in the free world, from 4,100,000 b/d to a total of 5,280,000 b/d at the close of this year, or a gain of 29 percent.

Firm plans of petroleum companies, as reported to defense officials in Washington, call for further expansion to a total rated refining capacity on a year-average basis of 14,300,000 b/d by the start of 1955, or 33 percent larger than the capacity just five years earlier.

A startling increase is being shown by natural gas liquids in the United States, where the 1950 capacity of 648,000 b/d is expected to reach more than one million barrels by the end of this year, and 1,160,000 by the start of 1955. This is a gain of 78 percent. Included are natural gasoline, condensate and other products. Virtually all segments of the industry shared in the growth, which is continuing. Thus, petroleum pipe lines, which have just finished a record-breaking expansion in the past two years, are to stand at 177,000 miles at the end of this year, compared with a mileage of 152,000 at the start of 1950. The total mileage

of natural gas pipe lines in the United States was 364,000 at the start of 1950, and is headed for 450,000 by the end of this year and 476,830 by the start of 1955.

The striking feature of the expansion, at least to defense planners, is that it is resulting, up to the present, in so little spare capacity. Planners are quick to point out that rising world-wide demand, based in general upon rising prosperity, is soaking up new capacity almost as rapidly as it is built.

Officials of the Petroleum Administration for Defense, who are receiving complaints of surplus refining capacity from many in the U. S. petroleum industry, do not regard the current situation as a threat to the stability of the industry.

They contend that all that is happening is that refineries are being operated at a higher than normal rate of activity.

"Present capacity is certainly not excessive when compared with past experience," says Joseph A. LaFortune, deputy head of the Petroleum Administration for Defense. To back up the statement, he made public recently a series of figures showing crude runs to stills and refining capacity year by year back to 1938.

The figures indicate that spare refining capacity promises to average out to 10.4 percent, or 815,000 b/d, during calendar 1953. In contrast, in no year except 1951 (with 9.2 percent) was there a narrower margin of reserve capacity, the figures show.

Bowing to claims of too much expansion, however, Mr. LaFortune did pare down the goal for expansion of the United States refining plant from 8,800,000 b/d by the start of 1955 to 8,500,000 b/d. The latter figure is based, it is explained, upon actual plans of the industry, and thus is likely to be achieved.

An outstanding example of expansion lies in the output of aviation gasoline, which came to 98,200 b/d in the United States in January 1950 for all grades, according to Bureau of Mines figures. The output soared to 224,700 b/d by January 1953, and to 251,400 by July 1953.

In refineries of the free world outside the United States, the output was 38,000 b/d at the start of this year, against foreign free world demand of 82,000 b/d, according to PAD. The bulk of the free world, non-U.S. production came from the western hemisphere.

The avgas program, at the same time, had been bothering defense officials. The PAD and the Armed Services Petroleum Purchasing Agency were out to persuade some 20 petroleum refiners to add 20,000 b/d more of alkylate capacity as a spare against demands of war. This was the gap between actual new capacity being built and the defense goal of 30,000 b/d of new capacity. In a letter, Deputy Petroleum Administrator LaFortune warned the industry that President Eisenhower and the National Security Council were ready to recommend government plants if industry did not come through.

By the end of the month, the picture had changed. The PAD, after talks with refiners in New York, came to the belief that there is more alkylate capacity in sight than first believed, and that military demands are going to be less than estimated. Thus, the government found, the 20,000-barrel goal is either in sight or can safely be shaved down somewhat.

Officially, the PAD gave its first optimistic view on the avgas situation September 29 when Mr. LaFortune addressed the National Petroleum Council. "We are temporarily over a hump on the problem of aviation gasoline," he said.

"Just now we have enough—and more than enough—aviation gasoline to meet all current requirements, military and civilian. At the same time, because plate steel has been short, we haven't been able to build enough storage to provide against future expected needs. So, we are out of balance at the moment."

For that reason, he explained, the PAD is suspending Order No. 3 for three months effective October 1. This order forbade the use of alkylate in automotive gasoline. Inside industry, the guess was that the suspension would end in final scrapping of the order. Earlier, the PAD had announced the ending, effective October 1, of Order No. 4 which set minimum amounts of tetraethyl lead to be used in commercial avgas.

Petroleum officials in the United States are immensely pleased with the expansion of the petroleum industry. Mr. LaFortune recently gave expression to this pleasure in a milestone report on the success of the industry in meeting government goals of the past four years. His letter to the Office of Defense Mobilization, which was unusually frank, said:

"We have made a survey to determine the expansion of facilities which industry can and will undertake under existing economic conditions.

"We have compared the resultant capacities with estimated requirements for petroleum in the United States and friendly foreign nations under conditions of (a) partial mobilization, and (b) all-out emergency.

"In general, the plans of industry indicate that the requirements under condition (a) will be met with a reasonable margin of safety. The problem, therefore, becomes one of assuring the availability of sufficient capacity to meet the requirements of an all-out emergency.

"The petroleum industry is unique, we believe, in that overall requirements under war conditions are not likely to be materially different from those in peace.

"Increased military requirements, with the exception of aviation gasoline, are just about balanced by savings which can be obtained through conservation and rationing of the civilian economy.

"Basically, then, the indicated need for developing reserve capacity results from an assessment of the ability of an enemy to render present capacity unavailable to the United States and its allies.

"The fact that capacity which would be lost to the free world under wartime conditions is available and operating to satisfy peacetime requirements makes the development and construction of further new facilities unattractive to the industry."

The letter further had this to say:

"We believe it is impractical to hope to develop reserve capacity in certain basic facilities, such as producing and refining, sufficient to cover a prolonged period of hostilities. The date of hostilities cannot be accurately predicted, and an achieved goal of reserve capacity might have to be maintained over a considerable period of time.

"It would be beyond the financial resources of the industry to build and maintain such a reserve capacity. Combined with similar requirements of other industries, we seriously question whether the financial resources of Government would be adequate for this purpose.

"Achievement of a goal and failure to continue actively in the development of resources and manufacturing facilities would result in the loss to industry of essential exploration, production, engineering and construction skills which would be vital in time of war. Alternatively, maintenance of a large volume of excess capacity over a period of time would result in an obsolete and inefficient plant.

"We have, therefore, attempted to balance the foregoing factors in determining whether and at what levels to recommend facilities expansion goals for the

petroleum industry. Through use of existing incentives such as accelerated tax amortization, we believe the industry can and will build approximately 15 percent excess capacity over anticipated peacetime requirements. This capacity, together with conservation, rationing, use of commercial and military stocks, and other war measures, will be sufficient to meet the initial impact of war and allow time for any expansion in productive capacity required by a prolonged period of hostilities."

As the letter contained little specific mention of refining capacity, it is generally assumed that the 15 percent spare capacity referred chiefly to refining plant ability.

In taking up one segment of the industry after another, the letter was most significant in its report on the ability of crude oil producers to do the job ahead for peace or war.

The LaFortune letter continued:

"Present estimates of productive capacity are substantially in excess of current requirements for partial mobilization, and would permit meeting the initial impact of wartime requirements. It appears that the materials supply situation will permit industry to drill sufficient wells to keep pace with growing demands and to continue to maintain reserve productive capacity roughly in line with the current reserve (estimated by the National Petroleum Council for the U.S. at 955,000 b/d in January 1953.)

"This we believe industry will do. We propose, however, to make periodic reviews of the productive capacity of the free world. Should the reserve margin reach a point which, in our opinion, jeopardizes the mobilization effort or the ability of the U.S. and other friendly nations to meet the initial petroleum demands of war, recommendations for the establishment of new goals as well as the providing of incentives to assure their attainment will be forthcoming."

A five-year growth of 42 percent in petroleum refining capacity in the free world outside the United States is indicated by a government study which sees a gain from 4,100,000 b/d in January 1950 to 5,830,000 b/d by the start of 1955.

The capacity at the start of 1952 is put at 4,500,000 b/d; at the start of 1953 at 4,800,000 b/d; and at the start of 1954 at 5,280,000 b/d.

The growth is even larger than it seems, as the 1950 figures include a production of some 550,000 b/d from Iran, while the latter figures represent a period when the Abadan refinery was shut down. If Abadan were to get into operation again, the capacity would be higher by whatever quantity was supplied from that source.

The figures, which are based on firm plans of oil companies rather than goals, are considered the most reliable to reach Washington in a long time.

TABLE I

CRUDE OIL AND NATURAL GAS LIQUIDS

United States

	Jan. 1950	1953	1954	1955	% of 1950
Capacity b/d	6,450,000	8,159,000	8,500,000	8,700,000	135
Production b/d	5,409,870	7,204,000	7,300,000	———	—
Reserve Potential b/d	1,040,130	955,000	1,200,000	———	—

Free World (Except U.S.)

Capacity b/d	4,000,000	5,350,000*	5,900,000*	6,200,000*	155
Production b/d	3,722,000	5,418,000	———	———	—
Reserve Potential b/d	278,000	202,000	———	———	—

*Excluding Iran

Entire Free World

Capacity b/d	10,450,000	13,509,000	14,400,000	14,900,000	142
Production b/d	9,131,870	12,352,000	———	———	—

TABLE II

REFINING CAPACITY

United States

	Jan. 1950	1953	1954	1955	% of 1950
Capacity b/d	6,696,000	7,693,000	8,100,000	8,500,000	127
Av. Thruput b/d	5,612,000	7,041,000	———	———	—
Surplus capacity b/d	1,084,000	652,000	———	———	—

Free World (Except U.S.)

Capacity b/d	4,100,000	4,800,000*	5,289,000*	5,830,000*	142

*Excluding Abadan

Total Free World

Capacity b/d	10,796,000	12,439,000	13,380,000	———	133

TABLE III

GROWTH OF REFINERY CAPACITY BY AREAS IN THE FREE WORLD EX. U.S.A.

(Thousands of Barrels Daily)

	Crude Capacity		Cat. Cracking		Thermal Crkg./Refmg.		Cat. Reforming		Polym'n. Product	
	'51	'55	'52	'55	'52	'55	'52	'55	'52	'55
Canada & Mexico	593	856	107	186	158	159	7	25	8	12
Caribbean & Colombia & Venezuela	1,285	1,515	53	67	580	667	0	10	2	2
Balance Western Hemisphere	272	375	0	27	78	159	0	0	0	6
Total West. Hemisphere	2,150	2,746	160	280	816	985	7	35	10	20
Free Europe	1,490	2,181	140	295	257	294	1	56	9	15
Africa, Middle & Near East	541	780	26	37	100	133	0	24	2	3
India, Australia, Far East	359	639	0	71	77	80	2	12	1	3
Total Eastern Hemisphere	2,390	3,600	166	403	434	507	3	92	12	21
Total Free Foreign World	4,540	6,346	326	683	1,250	1,492	10	127	22	41
% Increase (ex. Abadan)		40		110		20		1,170		87

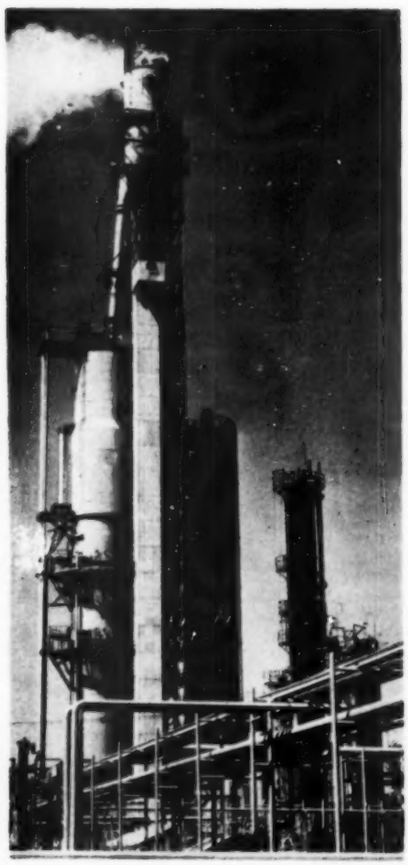
TABLE IV

DISTRIBUTION OF FREE WORLD REFINING CAPACITY EX. U.S.A.

	Number of Refineries		9,000 b/d & Over	
	1951	1955	1951	1955
Free Europe	104	116	39	50
Africa, Middle & Near East	13	20	9	12
India, Australia & Far East	32	39	6	19
Total Eastern Hemisphere	149	175	54	81
Canada & Mexico	41	46	19	26
Caribbean [incl. Colombia & Venezuela]	27	29	13	13
Balance West. Hemisphere	32	36	7	11
Total Western Hemisphere	100	111	39	50
Total Free Foreign World	249	286	93	131
Countries with Refineries	46	51	—	—

LARGEST HOUDRIFLOW UNIT ON STREAM

The Houdriflow cat cracker built for Texas City Refining Co. is the largest of its type to date.



THE WORLD'S LARGEST Houdriflow catalytic cracking unit has been placed on stream by Texas City Refining, Inc. It has a capacity of 19,000 barrels per day.

Basic process design of the new cracking plant was done by the Houdry Process Corp. of Philadelphia and the balance of the engineering was carried out by Kaiser Engineers of Oakland, Calif., which also constructed the big cat cracker.

A viscosity breaker and a vacuum flash tower were also part of the Texas City expansion program, as well as the modification of other equipment made necessary by the new Houdriflow unit. These were completed many months ago and put into service immediately, tying in with the older units of the refinery.

The Houdriflow unit stands on 19,000 linear feet of pilings driven to an average depth of 55 feet and capped by a 6-foot thick slab of concrete. Its tower is designed to withstand winds up to 135 miles per hour. There are about 15,000 tons of steel in the unit.

An innovation on the Houdriflow unit was a continuous bulk handling system which takes the pelleted catalyst from railcars to the top of the main storage vessel by means of a high-velocity air stream. The new all-weather system was designed to move 7½ tons of catalyst per hour, moving the pellets at a rate of 30 feet per second.

In the Texas City Houdriflow unit, the reactor is superimposed over the kiln in an integrated unit. Pelleted natural catalyst enters the top head of the reactor from the lift disengaging hopper. About 70 percent of the catalyst enters the reactor by way of a flowing annular curtain while the balance flows through peripheral downcomers that establish the catalyst bed depth.

The total reactor charge, approximately 19,000 b/sd, consisting of both vaporized gas oil from a flash tower and liquid vacuum gas oil plus recycle stock, is introduced to the reactor through a simplified nozzle situated centrally within the curtain of catalyst at the top of the reactor. This nozzle can spray a wide range of liquid-vapor mixtures onto the curtain of flowing catalyst. Cracking is completed as the hydrocarbon vapors flow downward through the solid moving-bed reaction zone. After cracking, the vapors are separated from the catalyst in a disengager and flow to the synthetic crude tower. The catalyst is next purged with low pressure steam in a short purge section to remove residual oil remaining on the catalyst. The vaporized residual oil joins the main stream of cracked vapors and flows to the fractionating column.

Spent catalyst enters the kiln that operates at low pressures, where regeneration is accomplished by the countercurrent flow of air. Three burning zones are provided for the combustion of 11,300 lb/hr. of coke.

In order to achieve accurate control of kiln temperatures, cooling coils are installed between the burning zones. Water circulates through pancake coils at a high ratio compared to steam production, thereby providing effective control and maintenance of uniform catalyst temperature.

After flowing through the kiln, the catalyst is collected by means of an arrangement of concentric cones into a single line through which it flows to the lift distributor vessel directly below the kiln. From this vessel the catalyst flows to the individual engagers on the ten 12-inch diameter lift pipes. The catalyst is raised to the lift disengaging hopper by a mixture of kiln flue gas and steam supplied at desired operation conditions to each lift through individual thermocompressors. A feature is the control of catalyst circulation rates by lift operating conditions, thus eliminating the necessity of valve adjustments in the catalyst lines.

The Houdriflow kiln and reactor have been designed to assure that flows of catalyst, oil vapors in the reactor, and air in the kiln are constant and uniform over the entire cross-section of each catalyst bed. Uniformity in distribution and contact time assures an optimum operation together with highest yields and quality of the cracked product. The quantity of catalyst deposit is essentially uniform on all catalyst particles. This facilitates regeneration control so that only catalyst regenerated to a consistently low residual carbon level is returned to the reactor.

Texas City Refining, Inc. is the outgrowth of a war-built Defense Plant Corporation installation. It then consisted of a 10,000 b/d Houdry fixed bed catalytic cracking unit, a 1,750 b/d hydrofluoric acid alkylation unit, approximately 1,000,000 barrels of storage and attendant facilities.

In 1948 ownership was acquired by the Cooperative Grange League Federation, Ithaca, New York, the Pennsylvania Farm Bureau Cooperative Association, Harrisburg, Pa. and the Southern States Cooperative of Richmond, Virginia.

Since 1948 major improvements have been made in an effort to keep pace with the industry. Two atmospheric distillation units were installed to provide charging stock for the cracking unit. A second 1,000,000 barrels of storage was erected to provide more flexibility.

Crude is received by either pipe line or water facilities from domestic sources. Finished products are delivered to markets up the Mississippi River, on the East Coast and portions are exported to foreign countries for consumption.

World crude production up 6.7 percent

WORLD PRODUCTION of crude petroleum has averaged 13,029,200 barrels daily during the first three quarters of 1953 according to estimates gathered by WORLD PETROLEUM. Output was 831,000 barrels, or 6.7 percent higher than in the same period last year.

Principal increases were in the United States and in the Middle East. In the Western Hemisphere, North American production was sharply higher, while South American fields produced less oil than a year ago. Oil markets previously enjoyed by Venezuela were constricted by the large increase in Canadian and U.S. production to the north and the increasing share of the European market supplied by the Middle East and, to a lesser extent, by new competition from Russian sources.

Western Hemisphere production increased 339,100 b/d in the first nine months of 1953 compared with the same period last year. The increase in the Eastern Hemisphere was 497,300 b/d. North American output was 362,500 b/d higher, and South American 23,400 b/d lower. Venezuela's loss was 69,400 b/d while some other Latin American countries reported gains. This was notably true in Argentina.

Canadian production was a third higher in the first nine months of this year, increasing 51,700 b/d to 210,900 b/d. The increase in the United States was 421,400 b/d or about 6.8 percent.

Gains in crude output were reported by all major producing areas in the Eastern Hemisphere. The Middle East led with an increase of 278,900 b/d. Most of the increase was from Iraq following completion late in 1952 of the new 30-inch pipe line from Kirkuk to the Mediterranean. Iraq production nearly doubled as a result of the completion of the new line, rising 231,100 b/d in the first nine months of this year compared with the same period a year ago.

Increases in Middle Eastern production centered largely in countries where British interests have a strong voice in operations. This is true because of the necessity for a build-up of Sterling crude to replace the oil which was nationalized by Iran. Saudi Arabian production has been lower this year than last. Bahrain has shown no change. In contrast, Iraq, as mentioned, has nearly doubled its output and substantial increases have been made in Qatar and Kuwait, the latter being 50 percent British. Kuwait output has been running 100,000 b/d higher than last year. Qatar output has risen about a third to 86,000 b/d.

Far Eastern production has risen about 30,000 b/d this year. The increase was in Indonesia, where the Minas field was opened to commercial exploitation at mid-year in 1952. Other fields in Oceania and East Asia have been largely static.

Result of the large increase in Eastern production is that the hemisphere now is virtually self sufficient for the first time in modern history. It is calculated that the Eastern Hemisphere will consume about 4,340,000 b/d of crude and products this year, including natural gas liquids. Daily average crude production in the first three quarters has been 4,055,100 b/d of crude. It is estimated that natural gasoline output will add another 100,000 b/d of petroleum hydrocarbons. Eastern Hemisphere shortage is thus only about 200,000 b/d. This means, of course, that South American nations which produce more oil than they consume must depend largely on the United States for a market in the future. There will be, of course, some cross hauling of both crude and special products but, on balance, the hemisphere will be self-sufficient in the immediate future.

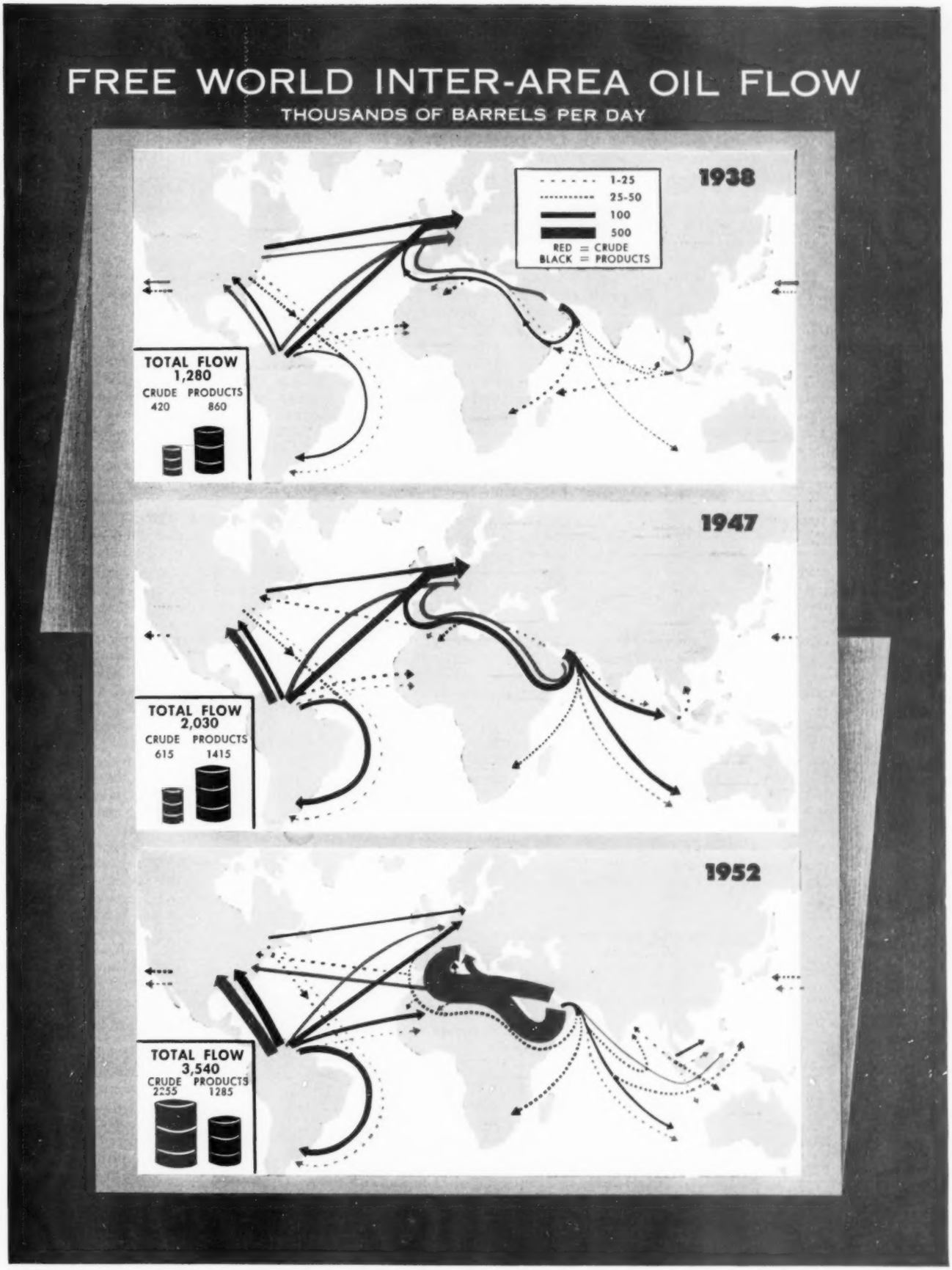
The growth of refinery capacity in Europe and Latin America since World War II and now the prospective increase in Africa and Asia has tended to accentuate national and regional self-sufficiency. This is highlighted by a chart which is reproduced with this article through the courtesy of Richard Haestier, editor of *Oil Progress*, house magazine of the California Texas Oil Co., Ltd. The chart was prepared by Dr. John M. Cassels, assistant director of economic research for Caltex.

Commenting on the shift in world trade in oil, Dr. Cassels points out a cogent reason why the United States is becoming an importing nation while supplies are building up elsewhere. He notes that since Drake's discovery the industry has drilled one exploratory well or dry hole to every 10 square miles of

WORLD CRUDE OIL PRODUCTION
(Thousands of Barrels Daily)

	1952	1953 First Quarter	1953 Second Quarter	1953 Third Quarter
NORTH AMERICA				
United States	6,264.5	6,549.0	6,476.0	6,540.3
Canada	167.0	167.2	201.4	264.0
Mexico	214.8	215.0	215.0	185.0
Total	*6,646.3*	*6,931.2*	*6,892.4*	*6,989.3*
SOUTH AMERICA				
Venezuela	1,803.9	1,743.4	1,744.3	1,707.6
Colombia	105.8	109.7	107.9	106.6
Argentina	68.2	74.4	77.8	78.0
Trinidad	57.4	60.2	61.0	61.1
Peru	45.5	43.6	45.3	44.0
Ecuador	7.7	7.8	8.0	8.0
Chile	2.2	3.1	3.0	3.0
Brazil	1.9	2.6	2.8	2.7
Bolivia	1.4	1.4	1.5	1.4
Cuba	0.3	0.1	0.1	0.1
Total	*2,094.3*	*2,046.3*	*2,051.7*	*2,012.4*
WESTERN HEMISPHERE	8,740.6	8,977.5	8,944.1	9,001.7
Europe & Africa				
Germany	33.9	38.0	42.0	43.1
Netherlands	13.6	13.2	16.0	16.2
France	6.6	6.7	7.1	6.8
Yugoslavia	3.2	3.0	3.0	3.0
French Morocco	2.1	2.0	2.0	2.1
United Kingdom	1.1	1.1	1.1	1.1
Italy	1.3	1.8	2.0	2.0
Algeria	0.8	1.2	1.9	2.5
Total (Excluding USSR & Satellites)	*62.6*	*67.6*	*75.1*	*76.8*
USSR	940.0	1,020.0	1,035.0	1,045.0
Romania	90.0	85.0	85.0	85.0
Austria	55.0	58.0	60.0	60.0
Hungary	9.5	14.0	14.0	14.0
Poland	4.0	4.0	4.0	4.0
Albania	3.0	3.0	3.0	3.0
Czechoslovakia	2.5	2.5	2.5	2.5
Total USSR & Satellites	*1,104.0*	*1,186.5*	*1,203.5*	*1,213.5*
Total Europe	*1,166.6*	*1,253.5*	*1,278.6*	*1,290.3*
NEAR & MIDDLE EAST				
Saudi Arabia	822.5	792.5	875.5	867.4
Kuwait	752.4	794.2	885.1	875.7
Iraq	383.4	543.6	579.1	593.3
Qatar	68.4	78.3	85.0	95.5
Egypt	45.0	46.3	46.5	46.5
Bahrain	30.1	30.0	30.0	30.1
Iran	27.5	23.7	24.0	25.0
Turkey	0.4	0.6	0.6	0.6
Total	*2,129.7*	*2,309.2*	*2,525.8*	*2,534.1*
FAR EAST & OCEANIA				
Indonesia	170.9	192.4	204.1	204.2
British Borneo	104.5	101.1	101.0	103.0
Japan	5.8	5.7	5.3	5.7
India	5.5	6.0	6.0	5.5
New Guinea	4.7	4.9	4.9	4.9
Pakistan	4.1	4.4	4.4	4.4
Burma	2.3	2.5	2.5	2.5
China	2.0	2.0	2.0	2.0
Total	*299.8*	*319.0*	*330.2*	*332.2*
EASTERN HEMISPHERE	3,596.1	3,881.7	4,134.6	4,156.6
WORLD TOTAL	12,336.7	12,859.2	13,078.7	13,158.3

* Includes India and Burma
** Included in Pakistan figure



The inter-area flow of oil has doubled since prewar. It has changed in composition and has taken a new geographic pattern. In 1938, two-thirds of the flow was made up of refined products; in 1952 two-thirds was crude oil. Before the war, the countries of Western Europe received 75 percent of their imports from North America and the Caribbean; today they get 85 percent from the Middle East. Chart courtesy "Oil Progress" published by California Texas Oil Co. Ltd.

petroliferous territory in North America. In the British Commonwealth only one dry hole has been drilled to 750 square miles, and in the USSR and South America the ratio is one to 1,500 square miles of petroliferous territory. Dr. Cassels commented:

"The countries of Western Europe, although among the largest users of petroleum products, have practically no indigenous oil resources. On the other hand, the principal oil fields found to supply their needs have been located in countries where the domestic uses for petroleum are, for the present at least, extremely limited. From the point of view of international trade this has meant a tremendous increase in the flow of crude oil and of refined petroleum products from the countries of the Caribbean, the Middle East and the East Indies to all the other countries of the free world, particularly to those with industrially advanced economies and relatively high standards of living. In more basic terms, the result has been that the oil-supplying countries have gained income from resources that hitherto had been valueless to them, while the oil importing countries have had the advantage of using a type of fuel more economical for many purposes than would otherwise have been available to them.

"A reflection of these developments can be seen in the accompanying map. The volume of the inter-area flow in 1952 was more than two and one-half times as great as it had been 14 years earlier. It will be noted, however, that the flow between the Western and Eastern Hemisphere which, in 1938, constituted a substantial proportion of the total, has now been markedly reduced and is made up almost entirely of refined products.

"Between 1938 and 1952 the flow from the Caribbean (crude and products) increased from less than 600,000 barrels per day to roughly 1,400,000 barrels per day. During the same period, the flow from the Middle East increased from about 250,000 barrels per day to more than 1,800,000 barrels per day.

"Before the war, the countries of Western Europe received 530,000 barrels per day (75 percent of their total oil imports) from North America and the Caribbean. In 1952 these countries imported nearly 85 percent of their petroleum supplies (about 1,350,000 barrels per day) from the Middle East.

"A somewhat similar change has taken place in the sources of supply drawn upon by countries in the area east of Suez. In 1938 these countries received more of their petroleum imports from North America than they did from either the Middle East or from the East Indies. In 1947, before the wells in the Indies had been brought back into production, these countries were relying on Middle East sources for practically all of their supplies. Since then, oil from the Indies has reappeared in these markets, especially in those lying farthest to the east, and for this group as a whole, in 1952, the shares of their imported supplies coming from different sources were: North America 12 percent, East Indies 31 percent, Middle East 57 percent.

"A significant alternation has also taken place in relative proportions of crude oil and refined products moving between producing and consuming areas. In 1938, two-thirds of the total flow was made up of refined products and only one-third of crude. In 1952, these proportions were reversed to two-thirds crude, one-third products. This change resulted from postwar decisions of industry and government to build most of the new refinery capacity needed in the areas of consumption, rather than to expand greatly the facilities located at or near the source of the crude. Western Europe, for example, by 1952 had almost reached the point of self-sufficiency in petroleum refining. New refineries have also been built in India, Australia and other consuming countries in the Far East."

In the annual report on world consumption of principal petroleum products recently released by the U.S. Bureau of Mines, it is shown that demand in 1952 was 5.5 percent greater than in 1951. The report covers 63 countries outside the Iron Curtain.

In the 63 nations, 1952 demand for principal products totaled 3,646,592,000 barrels, an average of 9,963,000 b/d, compared with 3,458,517,000 barrels or 9,476,000 b/d in 1951.

On a crude equivalent basis in the world as a whole, including the USSR and satellites, it has been estimated by C. J. Bauer of the Standard Oil Co. (N.J.) that total demand in 1952 averaged 12,782,600 b/d. This figure includes natural gasoline and condensate in addition to crude oil. The rate of increase in demand in the world as a whole is thus very close to that in the 63 nations surveyed by the Bureau of Mines.

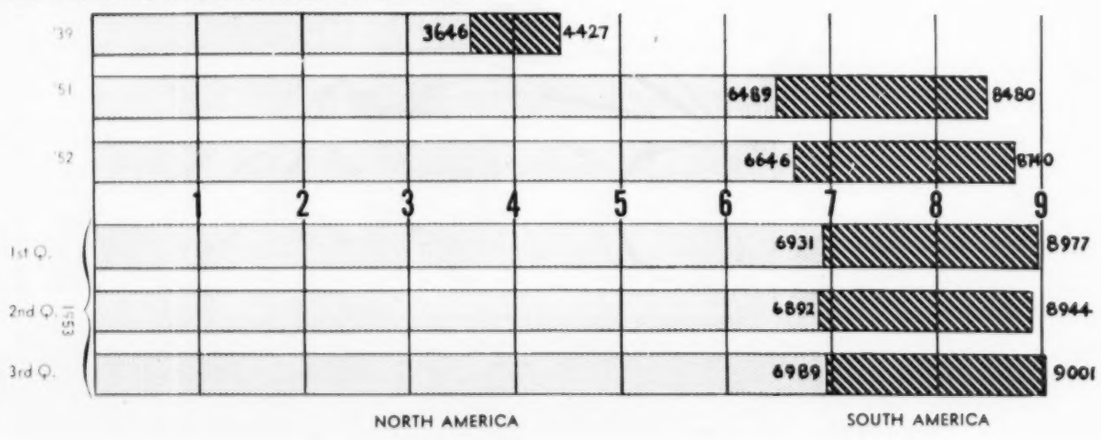
In the United States the increase in demand for principal products in 1952 was 3.7 percent, and in the 62 countries outside the United States, the increase was 8.85 percent. Both Canada and Mexico had far greater increase ratios than did the United States, Canadian demand being up 11.3 percent and Mexican demand 6.8 percent.

South American demand rose 8.6 percent in 1952, with Venezuela and Brazil both reporting tremendous gains. Brazilian consumption rose 17.6 percent over 1951 and Venezuelan 15.7 percent.

Except in Africa, every major area in the Eastern Hemisphere reported very large increases in demand to the Bureau of Mines. Consumption in western Europe was up 9.5 percent, Middle East 15.8 percent, and other Asia 15.8 percent in 1952, although the figures are not strictly comparable in the Bureau of Mines report. Comparing country by country, it is noted that Algerian consumption was down four percent, Egyptian demand 5.3 percent and Union of South Africa 10.4 percent. French Morocco and Tunisia showed very small increases.

In Western Europe all of the principal

TREND OF WESTERN HEMISPHERE CRUDE PRODUCTION



nations sharply increased their utilization of petroleum. France and Spain both enlarged their consumption by more than 16 percent, Italy by 12.5 percent, Western Germany 11.3 percent and the Netherlands 10.6 percent. The largest European consumer, the United Kingdom, used 7.6 percent more oil than in 1951.

In the Middle East, consumption rose at a very rapid rate in the countries where oil producing and refining activities are centered. This was true in Bahrain, Kuwait, Saudi Arabia and Syria-Lebanon and to a somewhat lesser extent in Iraq. Although outside the oil boom area, Turkey reported an increase of 24.8 percent.

Southern and Eastern Asia were somewhat spotty. In India there was a drop of 4.7 percent to 28,845,000 barrels, while Japan reported an astonishing increase of 49 percent in consumption.

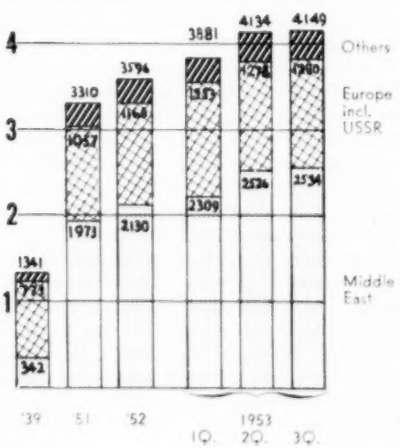
Indonesia showed large increases in demand, while the rate of change in Australia and New Zealand was much more moderate.

Domestic consumption of petroleum products by the USSR and satellites obviously is not rising as rapidly as production, since Russian salesmen are busy in world markets seeking to exchange petroleum for food, hides and manufactured products. Reports are that the new regime has adopted a policy of supplying the Russian people with more food, clothing and amenities. Russian and Romanian oil appears to be as good a medium of exchange as any which can be offered in international trade, and enough seems to be available for the purpose.

Premier Malenkov announced to the recent Party Congress that Russian output this year will rise about 9.5 percent to 1,040,000 b/d. This increase came at a time when war demand was declining. It was after the signing of the armistice in Korea that Russian oil sales activity increased.

(Please turn to page 150)

EASTERN HEMISPHERE PRODUCTION TREND



DOMESTIC DEMAND FOR MAJOR PRODUCTS

Estimated by U. S. Bureau of Mines — Thousands of barrels

NORTH AMERICA & CARIBBEAN	Motor Fuel	Kerosine	Distillate Fuel Oil	Residual Fuel Oil	Lubricating Oil	Year 1952 Total Major Products	Year 1951 Total Major Products
Alaska & Hawaii	4,707	167	3,309	6,054	123	14,360	12,623
Canada	65,660	10,100	32,231	38,603	2,650	149,244	133,884
Central America	2,590	430	2,740	6,180	100	12,040	12,813
Cuba	4,650	664	1,612	9,811	210	16,947	15,344
Mexico	17,874	6,196	5,910	29,206	575	59,761	55,968
Puerto Rico	2,572	685	292	3,002	57	6,608	6,210
United States	1,154,254	124,583	479,764	555,863	38,150	2,352,614	2,269,288
Other W. Indies	2,900	400	10,900	30,400	190	44,790	43,735
Total	**1,255,207**	**143,225**	**536,758**	**679,119**	**42,055**	**2,656,364**	**2,549,865**
SOUTH AMERICA							
Argentina	13,500	6,200	6,900	34,500	1,210	62,310	61,200
Bolivia	495	92	210	435	9	1,241	1,178
Brazil	20,397	2,718	6,285	14,900	1,069	45,369	38,655
Chile	2,725	617	1,000	5,008	158	9,508	9,385
Colombia	4,440	801	986	3,095	161	9,483	8,708
Ecuador	709	143	295	736	25	1,908	1,833
Peru	3,617	1,332	1,131	4,275	117	10,472	9,737
Uruguay	1,793	982	1,120	4,120	68	8,083	7,376
Venezuela	7,905	2,297	5,310	13,660	329	29,501	25,527
Other	195	65	45	5	20	330	430
Total	**55,776**	**15,247**	**23,282**	**80,734**	**3,166**	**178,205**	**164,029**
WESTERN EUROPE							
Belgium & Lux.	7,685	616	4,593	6,889	586	20,369	20,143
Denmark	4,185	625	2,737	4,778	262	12,587	12,136
Finland	2,265	475	1,090	959	150	4,939	4,556
France	29,150	995	16,340	46,700	2,675	95,860	82,258
Germany, Western	14,264	390	15,450	8,248	2,492	40,844	36,697
Greece	2,150	720	2,050	3,750	115	8,785	8,668
Iceland	430	30	725	475	25	1,685	1,615
Ireland	2,590	827	619	1,761	110	5,907	5,628
Italy & Trieste	8,750	1,885	8,775	28,310	945	48,665	43,258
Netherlands	5,710	2,250	8,690	14,720	520	31,890	28,850
Norway	2,459	390	5,307	5,530	229	13,915	12,535
Portugal	1,445	999	1,830	2,865	130	7,269	6,905
Spain	4,795	245	2,720	4,450	350	12,560	10,812
Sweden	7,564	2,140	12,982	12,327	520	35,533	33,584
Switzerland	3,281	530	4,770	530	250	9,361	9,039
United Kingdom	53,381	15,186	28,562	52,320	5,350	154,799	143,920
Total	**150,104**	**28,303**	**117,240**	**194,612**	**14,790**	**504,968**	**460,604**
MIDDLE EAST							
Bahrein Is.	95	63	1,328	7,088	13	8,587	7,722
Iraq	810	890	510	2,750	120	5,080	4,850
Israel	1,350	1,070	910	3,120	100	6,550	6,370
Jordan	240	175	98	—	6	519	527
Kuwait	179	64	133	6,318	2	6,696	5,367
Saudi Arabia	935	130	2,645	9,009	25	12,744	10,356
Syria-Lebanon	1,566	568	1,212	1,620	63	5,029	3,758
Turkey	2,675	1,570	1,500	350	275	6,370	5,103
Total	**7,850**	**4,530**	**8,336**	**30,255**	**604**	**51,575**	**44,053**
OTHER ASIA							
Burma	710	290	220	230	50	1,500	1,460
Ceylon	1,051	538	1,175	3,668	60	6,492	6,471
India	8,095	8,670	4,960	5,775	1,345	28,845	30,195
Indo-China	1,081	332	350	282	84	2,129	1,620
Japan	9,850	675	2,495	19,750	2,390	35,160	23,635
Malaya	2,525	585	5,875	9,860	170	19,115	15,743
Pakistan	1,490	1,423	1,265	4,620	210	9,008	9,275
Thailand	1,286	493	858	—	89	2,726	2,370
Total	**26,088**	**13,106**	**17,198**	**44,185**	**4,398**	**104,975**	**90,769**
AFRICA							
Algeria	1,970	457	1,085	5,273	134	8,919	9,276
Angola	275	35	75	55	23	463	—
Cape Verde Is.	24	3	395	1,928	1	2,351	—
Egypt	2,450	5,295	[a]4,316	[a]17,802	342	30,205	31,797
Ethiopia	—	—	—	—	—	—	187
Rhodesia and Nyaseland	—	—	—	—	—	—	1,635
Sp. Morocco and Tangier	—	—	—	—	—	—	2,957
Madagascar	348	72	128	1	45	594	—
Morocco, French	2,250	325	975	1,740	120	5,410	5,309
Sudan	450	130	280	575	50	1,485	—
Tunisia	700	265	650	600	62	2,277	2,201
Un. So. Africa[b]	[a]10,170	3,270	2,980	2,700	600	19,720	21,775
Total	**18,637**	**9,852**	**10,884**	**30,674**	**1,377**	**71,424**	**75,137**
OCEANIA							
Australia	21,798	3,591	9,750	7,960	1,487	44,586	42,649
Indonesia	3,690	2,950	3,280	4,360	190	14,470	11,918
New Zealand	5,310	225	1,400	2,640	250	9,825	9,220
Philippine Is.	4,150	1,195	2,550	2,415	250	10,560	10,273
Total	**34,948**	**7,961**	**16,980**	**17,375**	**2,177**	**79,441**	**74,070**
GRAND TOTAL	**1,548,610**	**222,224**	**730,678**	**1,076,954**	**68,486**	**3,646,952**	**3,458,517**
Daily Average	**4,231**	**607**	**1,996**	**2,942**	**187**	**9,963**	**9,476**

[a] Includes transit trade in ship bunkers. [b] Includes South West Africa.

Trans Mountain

S. D. Bechtel, chairman, Trans Mountain Pipe Line Co.

FIRST ALBERTA CRUDE to reach the Pacific Coast via pipe line arrived from Edmonton through the 718-mile Trans Mountain Oil Pipe Line Company line Thursday afternoon October 15 when a brief opening ceremony was held at the Trans Mountain terminus in Burnaby, ten miles from the city of Vancouver.

In an informal ceremony, a small plaque was unveiled by S. D. Bechtel, chairman of Trans Mountain's board of directors, and R. L. Bridges, president of the pipe line company. During the open house which followed, 2,500 people toured the site as guests of the company.

Guest of honor at the opening and the dinner and reception which followed in the evening was Hon. John D. Kearney, Chief Commissioner of the Board of Transport Commissioners at Ottawa. Another special guest was Hon. W. A. C. Bennett, premier of British Columbia.

Prominent petroleum industry officials and civic heads of the municipalities adjoining the pipe line terminus and tank farm site attended the ceremony, which was greeted throughout British Columbia as a milestone in the history of the province.

Included in the list of distinguished guests were Alderman Halford Wilson of Vancouver and Reve W. R. Beamish of Burnaby. In addition to the civic officials, the opening was attended by company executives and directors.

Other guests from major oil and pipe line companies included E. G. Smith, director, Anglo Canadian Oil Co., Ltd.; Ole Berg, president, British American Oil Co., Ltd., and M. S. Beringer, chairman of the board; W. K. Whiteford, president, Gulf Oil Corp.; J. F. Barrett, general counsel, Imperial Oil Ltd.; J. R. White, president, Imperial Oil Ltd.; Frank Rehm, industrial relations, Shell Oil Co.; P. H. Swinchatt, president, Shell Pipe Line Corp.; Reese H. Taylor, president, Union Oil of Calif.; Croft Brook, assistant to the president, Standard Oil Co. of British Columbia; Vic Wiebe, refinery superintendent, Standard Oil Co. of British Columbia; Van W. Rosendahl, president Bechtel International and Canadian Bechtel; and E. F. Morrill, manager, Mid-Valley Pipe Lines.

Construction of the Trans Mountain oil pipe line is a logical outgrowth of the rapid expansion of oil production in the prairie provinces of Canada. Following the sensational discovery of Leduc in February 1947 and of Redwater early in the following year, a whole series of fields of varying extent were brought in in rapid succession. It soon became evident that Alberta and its neighboring provinces constituted one of the potentially great oil fields of the world. Within a couple of years the wells in operation were able to supply more than the requirements of the local markets, and a system of proration had to be established to limit output to the needs of the immediate area.

Known reserves, which were estimated at slightly over a billion barrels in 1950, have now risen to around two billion, although only a small proportion of the

Pipe Line Opens New Canadian Oil Markets

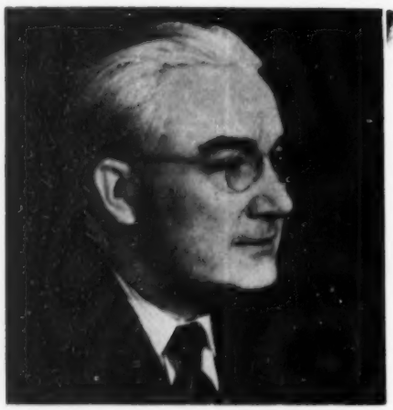
One of the toughest portions on the route was the section through Coquihalla Pass. Route for machinery and bed for pipe had to be hewn out of solid rock.

potential oil bearing area has been subjected to prospecting. Obviously the utilization of the vast resources of western Canada could take place only by providing access to more distant markets.

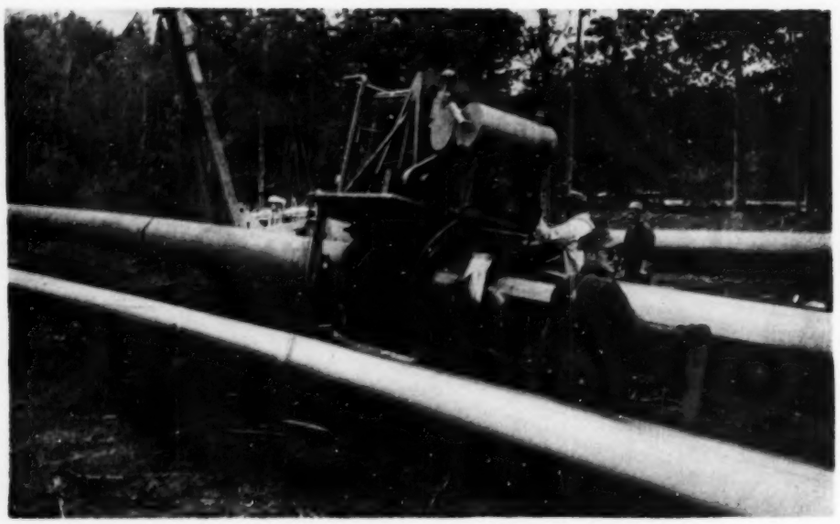
The first step in this direction was taken in 1950 with the building of the Interprovincial Pipe Line, 1,127 miles long, from Redwater, Alberta, to Superior, Wisconsin, with tanker connection extending deliveries to refineries in Ontario. To supplement lake transportation, an all-land line is now being built from Superior to Sarnia, Ontario.

Another market beckoning to Alberta producers was the Pacific Coast section of Canada and the northwestern region of the United States. This rapidly developing district had been dependent on California for its supplies, but these were becoming inadequate to the state's own needs, requiring imports from overseas.

In 1950, studies of possible pipe line routes from Alberta to the Pacific Coast were made under direction of S. D. Bechtel and his associates in the Bechtel organization, and in March 1951 the Trans Mountain Oil Pipe Line was chartered under a special act of the Canadian Parliament. Later in the same year, a permit was granted by the Board of Transport Commissioners of Canada authorizing the company to construct and operate a crude oil line from the vicinity of Edmonton, Alberta to Vancouver, British Columbia. This permit was later amended to provide for the building of a spur line from Sumas, British Columbia, to the inter-



Above, H. H. Anderson, executive vice president and general manager for Trans Mountain. Below, D. L. Roberts, vice president Canadian Bechtel Ltd.



Clean and prime machine near Dufficld.

Rail crossing in the mountains.

national border in anticipation of deliveries to refineries in the Puget Sound area. Meanwhile, the company had assured itself of supplies to fill the line by contracts with leading producers in Canada.

While the parliamentary act authorizing the line specified an all-Canadian route, preliminary surveys had already indicated that such a route was the most direct and most economical to construct.

After thorough engineering inspection by aerial and surface studies, a course was selected for the line following the Canadian National Railway for 510 miles westward from Edmonton, and crossing the Rockies through Yellowhead Pass at an elevation of 3,720 feet, only 1,400 feet higher than Edmonton. A second high of 3,900 feet is traversed on the plateau south of Kamloops, British Columbia, and the Coast Range is crossed through Coquihalla Pass at 3,760 feet. The route traverses 50 miles of wheatland, 200 miles of rolling timber country, 398 miles of mountains, valleys, plateaus and canyons, and 70 miles of farmland. Total length of the main line is 718 miles. In addition there is the 5½-mile spur from Sumas Junction to the international boundary. Throughout its course, the 60-foot right-of-way has 72 stream and river crossings, 56 highway crossings and 24 crossings of two railway lines.

While the physical characteristics of the route presented no difficulties that professional pipe line engineers regard as extraordinary, much of it lay in mountainous country with few roads, and special hydraulic problems were presented by the sections between Yellowhead Pass and Kamloops where the line drops 2,600 feet in 300 miles and down the Coquihalla Pass where it descends 3,600 feet in 30

miles. Based on probable requirements of the line, it was decided to use pipe of 24 inch diameter which, with two pump stations, was calculated to provide an initial capacity of 75,000 barrels daily. Later it was decided to move the starting point of the line 19 miles eastward to East Edmonton and to increase daily capacity to 150,000 barrels by adding two more stations, increasing the number of pumps in the original sections and adding to the storage capacity at the terminals. By raising the number of pump stations to six, a later capacity of 200,000 barrels daily is expected to be reached.

Contracts for the 150,000 tons of steel to be used on the line were placed with Consolidated Western Steel Company, Kaiser Steel Company and A. O. Smith Company. Open hearth steel with a yield strength of 150,000 psi was specified. Wall thickness of 5/16-inch was used on the mountain sections of the line with $\frac{1}{4}$-inch on the remainder.

Construction of the line was assigned to Comstock Midwestern Ltd., Mannix Ltd., and Canadian Pipeline Construction Co. Ltd. Actual construction began February 27, 1952 and during the remainder of the year, 329 miles of pipe were laid, including major crossings of the Athabasca, Saskatchewan, Pembina and McLeod rivers.

During 1953, construction was speeded up. A contract for 53 miles of the easterly section of the line was placed with Anderson International Contractors Ltd., and Missouri Valley Canadian Ltd. undertook the 2,350-foot crossing of the Fraser River at Fort Mann. This was considered one of the most difficult jobs in the whole undertaking, but it was successfully accomplished by welding two sets of pipe, mounting them on dollies on a narrow gauge railway, applying the enamel coat and wrapping, placing rings of concrete to hold it at the bottom of the stream and then pulling it across with two powerful winches. The steep Coquihalla Canyon spread was completed on September 28, and the final 25-mile gap to Burnaby on Vancouver harbor was closed on September 30.

The pipe is buried throughout its length and is coated and wrapped with coal tar primer, enamel, glass fiber and impregnated felt. The normal cover is 30 inches, but on rocky sections this is reduced to 24 inches and on the prairie, where winter cold is severe, a 36-inch cover is provided.

The four pump stations which are to move oil through the pipe line are designated as follows: "Edmonton," located six miles east of the city of that name; "Edson," nine miles west of Edson, Alberta; "Black Pool," seventy miles north of Kamloops, and "Kamloops," four miles west of Kamloops.

All stations are equipped with Nordberg diesel engines driving Bingham centrifugal pumps through Dominion Engineering speed increasers. Edmonton station is equipped for "parallel" pump operation. It has three duo-fuel, supair-thermo supercharged, 8-cylinder, 1,760-hp, 500-rpm engines, operating principally on natural gas. These are direct-coupled to speed increasers having a 1.0 to 7.6 ratio. A pedestal bearing is installed between the engine and the fire-wall. The speed increasers are direct-coupled to WSB 5-stage centrifugal pumps. The main units at Kamloops station are similar except that the engines are equipped only for liquid fuel. The Black Pool station, to be completed in December, will contain equipment similar to that at Kamloops.

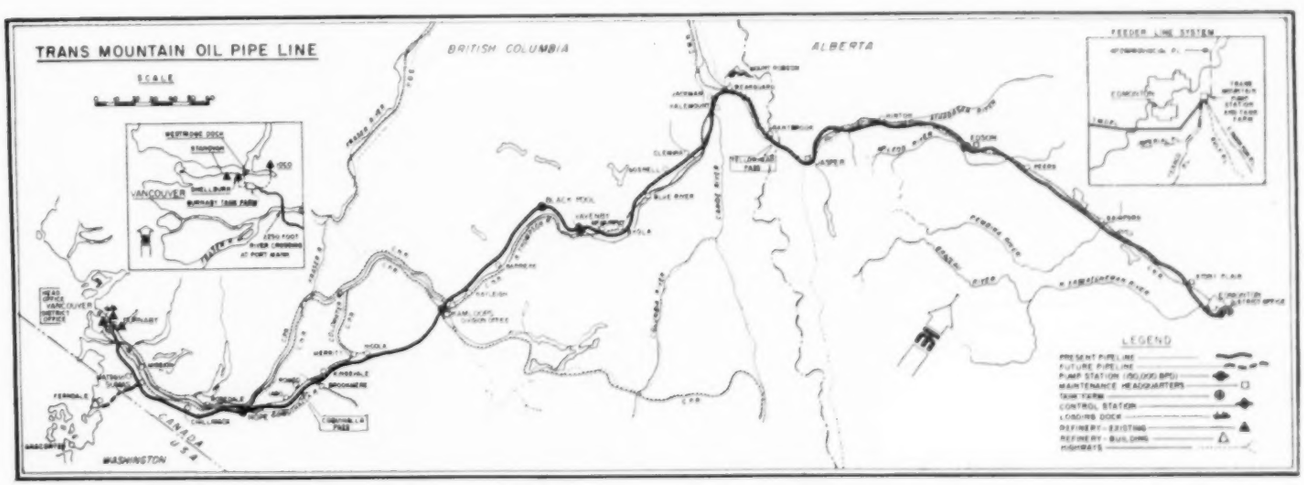
Edson station is equipped for "series" pump operation. It has three supair-thermo supercharged, 6-cylinder, 1,320-hp, 500-rpm engines, direct-coupled through the fire wall to speed increasers having a 1.0 to 8.2 ratio. These are coupled to single-stage centrifugal pumps. Future stations at Gainford and Jasper, to accommodate a 200,000 b/d throughput, will be similarly arranged for series pump operation.

With one unit each operating at Edmonton and Kamloops, the line has a capacity of 75,000 barrels daily. This may be increased to 120,000 barrels daily by operating two units each at Edmonton, Edson and Kamloops. To increase the capacity to 150,000 barrels daily, two units operating at each of the four stations including Black Pool are required. The third at each station serves as standby.

Much study was given to the comparative merits of parallel and series arrangements of the station pumping units. It was finally determined that the parallel arrangement was more economical for the high static head conditions encountered at Edmonton, Black Pool and Kamloops, and that series arrangement was more suitable for Edson and later for Gainford and Jasper.

At Edmonton, with a throughput of 120,000 barrels daily, the static lift will be about 45 percent of the total pumping head. Similarly, at Kamloops the static lift will be about 65 percent. Under such conditions parallel unit operation is of distinct advantage because flows up to 75,000 barrels daily can be handled by operation of a single unit. If series units had been installed, two of them would have to be operated either throttled or at reduced speeds and at greatly reduced fuel efficiency. The line's actual throughput demand could not be predicted closely, and it was economical to install station equipment in rather large increments. For this reason the parallel pumping units at the high static lift stations offered the most economical and flexible arrangement.

Although the line flow can be manually controlled with the station tanks floating on the line, three types of automatic engine control devices at stations are being provided: (a) one group, sensed by unit flow meters, will distribute the load



equally between the "parallel" pumping units; (b) another group will maintain station intake and discharge rates in synchronism; and (c) a third group, including Foxboro "Tivy Boxes," will permit automatic placing or substitution of pumping units into service.

Crude oil for engine fuel is drawn off the main line and gauged into station tanks. It passes through a settling tank and heater into a Sharples centrifuge whence it is run to a pure fuel tank for engine supply. The pure fuel tank is in the fuel preparation room where it is kept at normal temperature.

At Edmonton, the diesels operate as duo-fuel engines, using five percent liquid fuel and 95 percent fuel gas purchased from Northwest Utilities Ltd. The main gas supply is received through a regulator at 60 psi. It passes through a scrubber at that pressure to the fuel gas header. At each engine it then flows through a low-pressure supply regulator and a Fulton Sylphon safety shut-off valve controlled by engine fuel-oil pressure.

Each station has about 30 electric motors driving auxiliary equipment. Electric power supply for their operation at Edmonton and Kamloops is purchased from public service companies. Standby power supplies have been installed at both stations in the form of engine-driven generator sets. The Caterpillar engine at Edmonton is equipped to operate on natural gas, and that at Kamloops on diesel fuel. Electric power at Edson and Black Pool stations must be generated locally; thus slower-speed crude oil burning diesel-driven units are installed in duplicate, one being sufficient to carry the load and the other serving as a standby. The Edson engines are by Dominion Engineering, and those at Black Pool are by Cooper-Bessemer. Electric generators and exciters are of Canadian General Electric or General Electric manufacture.

Each station has two heating systems: (1) forced-circulation hot-water heating in the main pump house, and (2) gravity-return steam heating in the combination garage and fire-pump house. The water in the pump house system is heated either by exhaust-silencer waste heat boilers or auxiliary crude oil fired boilers of 1,000,000 Btu/hour capacity. Two of the Nordberg engines operating near full load will generate sufficient heat for the waste heat boilers to warm the pump house in the coldest weather. Operation of these boilers is automatic. However, under light engine loads in cold weather, the oil fired boiler, manually started, operates automatically with an induced-draft fan working through a time relay. The steam for each auxiliary building is generated in a diesel oil fired boiler operating at two psi under automatic electric control.

The first pressure-limiting station is located at Vavenby, which is 165 miles west and 2,100 feet lower than Yellowhead Pass. An automatic valve at Vavenby will shut to insure that static head downstream to the Thompson River crossing at Kamloops with an elevation of 1,120 feet will be reduced by 650 feet to a safe head of 2,160 feet.

The other pressure-relief station is located at Hope, about 30 miles west of the 3,760-foot summit of Coquihalla Pass. Here a battery of relief valves can spill oil into two 50,000-barrel tanks so that the pressure in the pipe from Hope to Burnaby may be reduced to limits of safety in case of accidental closure of a valve against the main line flow.

Use of this pressure-limiting equipment saved about $5,000,000 in the original line investment by avoiding need for heavier-wall pipe to withstand high pressures during accidental shut-offs in the low sections of the system.

Communications facilities along the line include:

(1) a telephone circuit consisting of a leased specially-installed metallic pair approximately paralleling the pipe line from end to end and connecting about 25 locations;

(2) a leased teletype service connecting some seven locations;

(3) company-owned dual-frequency radio facilities, including nine fixed stations and 25 mobile stations.

The telephone circuit is primarily for dispatching purposes, connecting all pump stations, terminals, maintenance headquarters and scraper traps, plus a number of emergency sets in pole-mounted boxes at convenient points. The metallic pair is marked on the crossarms to permit use of portable clip-on telephones. It is of interest that no public telephone service is available along 250 miles of the route between Jasper, Alberta, and Little Fort, British Columbia. The circuit was provided by Canadian National Telegraphs.

Ringing of all regularly connected instruments from dispatchers' office and from Edmonton station is to be made possible by installation of an electronic tone-response ringing system.

The teletype service, taken on a temporary basis to determine its need, connects the offices and pump stations. It is intended normally for administrative messages, but can be taken over by dispatchers if the telephone circuit fails due to slides or washouts. Although over much of the route the telephone and teletype circuits normally are on the same CNT pole line, the teletype can be routed differently in emergencies.

Primarily to maintain contact with maintenance personnel, but also to further insure continuity of dispatch communication, nine fixed radio sets are located at terminals, pump stations and maintenance headquarters. The 2,628-kc. channel had been found surprisingly effective in piercing the mountainous terrain on a point-to-point basis and with a minimum of manual relaying. The VHF channel is for normal communication with and between trucks, cars and other vehicles. These vehicles carry sets operating in both channels. Walkie-talkie sets function on the VHF for local contacts during crew operations.

Trans Mountain's own trunk line dispatching is handled on an around-the-clock basis from the Vancouver head office. Working shifts, the dispatchers normally communicate with terminals, stations and other points over the telephone circuit. The teletype is used to transmit extended dispatching orders and to gather daily reports. It is also available should the telephone circuit fail, as are the nine fixed radio stations along the route which operate effectively in the "medium frequency" band.

The major oilfields in the Edmonton area are connected to Trans Mountain's eastern terminal by five gathering and feeder pipe lines of other carrier companies. These include lines of the Imperial Pipe Line Company Ltd. from Leduc, Golden Spike and Woodbend; Edmonton Pipe Line Company Ltd. from Joseph Lake, Armena and Camrose; Texaco Exploration Company from Wizard Lake and Bonnie Glen; Canadian Gulf Pipe Line Company from Duhamel, Malmo, Stettler, Fenn and Big Valley; and Interprovincial Pipe Line Company from Redwater and Excelsior.

The Edmonton terminal, situated on a 160-acre tract and subject to rigorous winter weather, contains eight 150,000-barrel and four 80,000-barrel steel cone-roof tanks. The western terminal at Burnaby near Vancouver is situated on a 200-acre tract at an elevation of 495-575 feet above tidewater on Burnaby "mountain." This terminal, in an area subject to milder winters, contains six 150,000-barrel and four 80,000-barrel steel floating-roof tanks. The numbers and capacities of terminal tanks will permit the handling of at least three and possibly four types of crude oil. Those scheduled for receipt as initial line-fill are designated as "Redwater," "Light Mix" and "Leduc." The Burnaby terminal contains a special skimming sump to clean up tank bleedings.

The marine loading dock at Westridge on Burrard Inlet is fed by gravity flow from the Burnaby terminal through 2½ miles of 24-inch line. Local pipe lines have been privately constructed by Imperial Oil and Shell Oil to connect the tank manifold at Burnaby with their recently modernized and enlarged refineries on Burrard Inlet. Both can deliver 50-60,000 barrels daily under gravity flow. Standard Oil Company of British Columbia Ltd. has announced a proposed enlargement of its nearby Stanovan refinery, also on Burrard Inlet, and the construction of a private pipe line connecting it to the Burnaby terminal.

The intermediate pump stations on the Trans Mountain line are equipped with one or two 80,000-barrel tanks. It is con-

templated that these tanks will be used only in emergencies. The steel tanks at Edmonton terminal were supplied and erected by Toronto Iron Works Ltd. Those at Burnaby terminal and at the Edson, Black Pool and Kamloops stations were supplied and erected by Horton Steel Works Ltd. The grading and drainage work at Burnaby alone cost about $250,000. The general contractor for Burnaby terminal was Marwell Construction Company Ltd.

At North Kamloops, British Columbia, a take-off has been provided to service the new 5,000-barrel daily capacity refinery being erected by Royalite Products Limited which is expected to go on stream in late 1953 or early 1954.

The marine loading dock at Westridge is an L-shaped structure, the main pier 275 feet long and the dockhead 150 feet long with 85-foot walkway extensions at each end. As initially constructed, the dock can accommodate one T2 or smaller tanker and several barges.

The 24-inch line from Burnaby to the dock will deliver up to 20,000 barrels per hour by gravity. A unique system of friction tubes in parallel is located on shore for control of flow rate. Adjacent are two 10,000-barrel cone-roof tanks for use in changing types of oil in the delivery line and a 50,000-barrel cone-roof tank and a sump for ballast water skimming. Also provided are the usual oil transfer lines, ballast discharge lines, a fresh water line from shore, fire protection facilities, telephone communications and a floodlighting system.

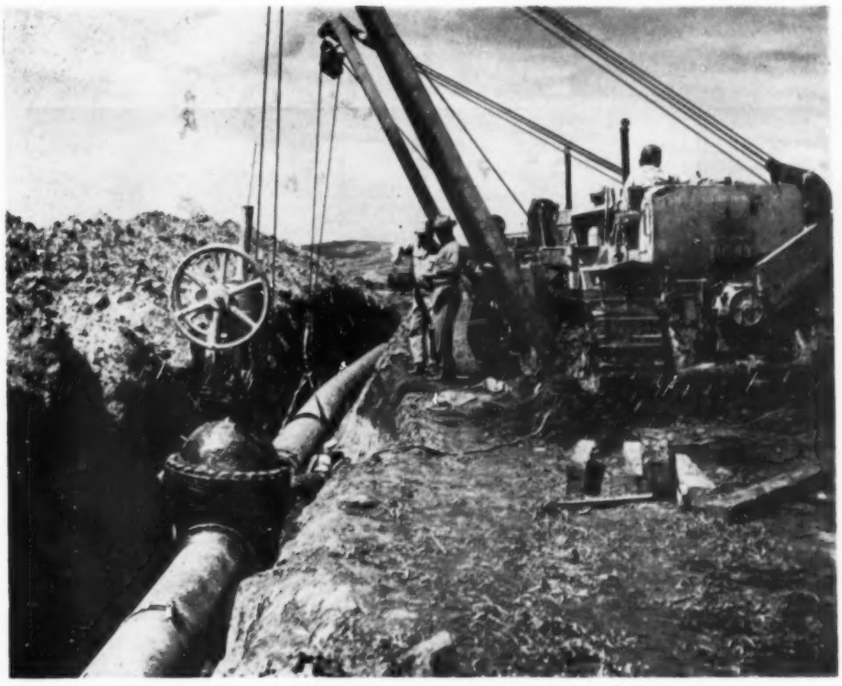
Provision has been made for delivery of oil by spur pipe line to the 35,000-barrel capacity plant of General Petroleum Corporation southwest of Ferndale, Washington. This plant is scheduled for completion in late 1954. A 24-inch spur is to take off from the main 24-inch line at Sumas Junction, about 70 miles east of Vancouver, and extend 5½ miles to the international boundary. During the spring of 1954, this 24-inch spur will be extended 15 miles to Laurel, Washington, with a 16-inch lateral 11 miles to the Ferndale plant. The total spur distance from Sumas Junction to Ferndale is 32 miles. Sufficient static head exists on the line from Coquihalla Pass to gravitate oil at a 200,000 barrel daily rate as far as the Seattle area, thus making installation of break-out tanks at Sumas Junction unnecessary.

The volumetric capacity of the 718 pipe miles of 24-inch main line is almost exactly 2,000,000 barrels. In preparing the system for operation, oil was pumped into the line to displace water at a rate of about 75,000 barrels daily, with interim shutdowns as required to accommodate the line completion and pressure testing program still in progress ahead. Rubber plug-type "pigs" or scrapers were run ahead of the oil and between each batch interface. Filling the line from Edmonton was started August 23, with its arrival in Burnaby scheduled about October 5.

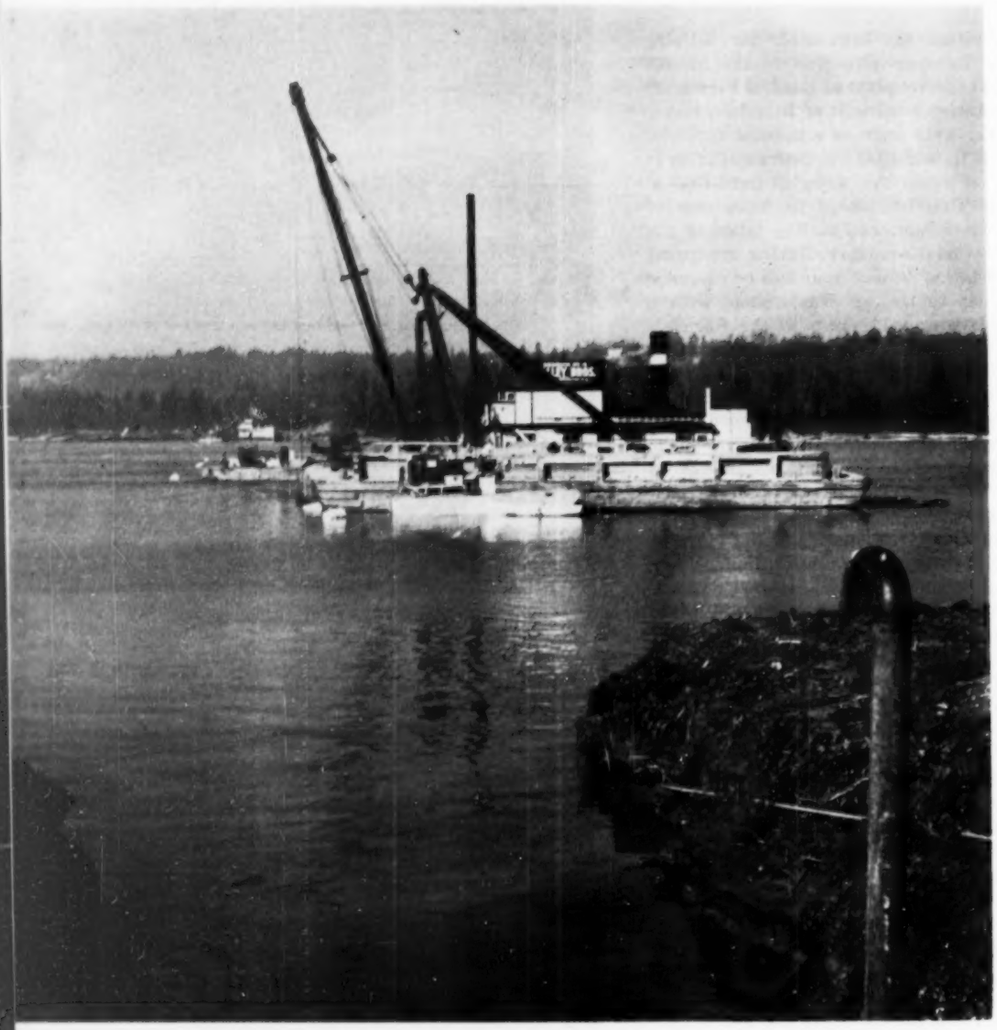
As a common carrier, Trans Mountain's tariff follows customary practice in the industry. For continuous shippers, the minimum tenders are 100,000 barrels in

Steep going on the mountain section of the line.

Approach to No. 4 crossing of the Fraser River west of Jasper showing weights in place.



Gate valve installed 50 miles west of Edmonton.



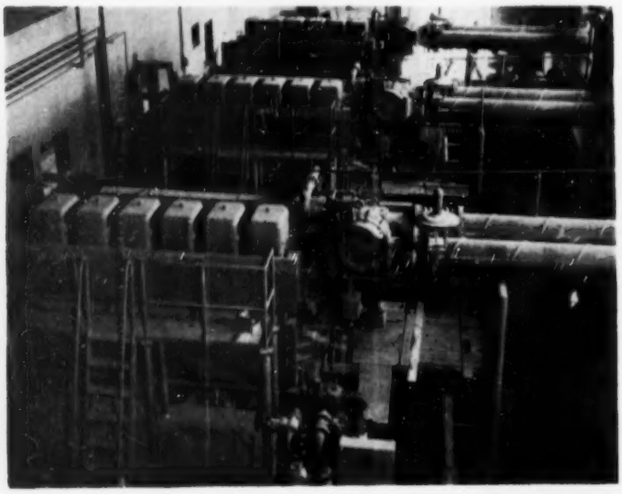
Looking northward across Fraser River from Port Mann, showing location of Trans Mountain pipe crossing.

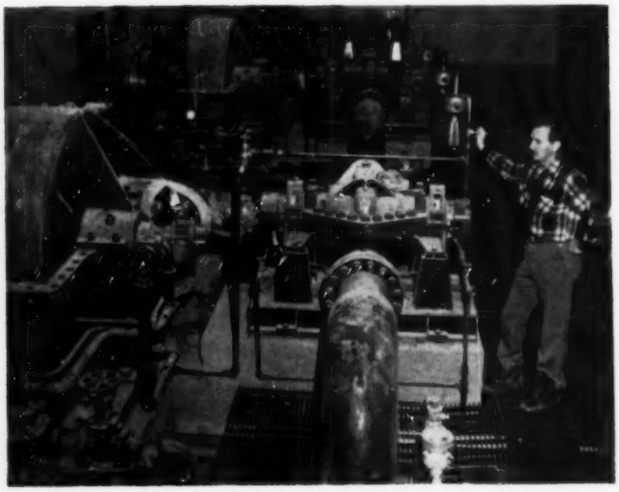
any 35-day period, with receipts and deliveries limited to 15,000-barrel minimum lots. Occasional or spot shipments of 50,000 barrels minimum will be accommodated, providing facilities are available and the entire shipments can be received and delivered in single lots.

The tariff rate published initially for the trunk line movement from Edmonton to Burnaby is 45 cents per barrel delivered. The company undertakes to load tankers at its Westridge marine loading dock for 2½ cents per barrel. For the refiner shipping via the projected spur line into Ferndale, Washington, a through rate has been quoted from Edmonton of two cents per barrel above the Burnaby rate.

When the Trans Mountain Company was formed, a sum of about $80,000,000 was obtained by sale of bonds and shares to cover the estimated cost of a two-station line of 75,000 barrels daily capacity extending from a then-proposed terminal at Acheson, Alta., to the terminal at Burnaby, British Columbia. After the decision was reached to originate the line 19 miles further east at East Edmonton, Alta., to raise the daily capacity to 150,000 barrels daily by adding two pump stations and increasing the numbers of pumps in original stations and the numbers of tanks in the two terminals, to build the marine loading dock in Vancouver Harbor and to build the spur line from Sumas Junction to the international boundary, the cost was raised to $93,000,000. A review of actual costs indicates that the work originally projected was completed approximately within the original estimates.

The board of directors of Trans Mountain Oil Pipe Line Company consists of S. D. Bechtel, president of Bechtel Corporation, chairman; R. L. Bridges, attorney,





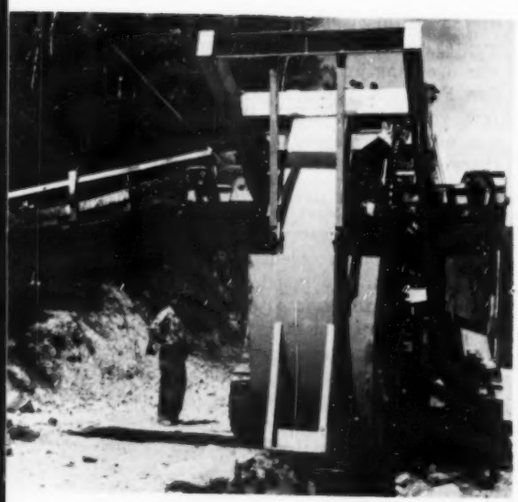
Nordberg engines at the Edson, Alberta, station are of the 13-inch bore, six cylinder type rated 1,330 hp at 500 rpm. Each drives a Bingham 10 x 12 single-stage centrifugal pump through a Dominion speed increaser with an 8.2:1 ratio. Total horsepower at the four pumping stations is 20,010.

Thelen, Marrin, Johnson & Bridges, president; W. M. V. Ash, president Shell Oil Company of Canada Ltd.; R. D. Baker, president Standard Oil Company of British Columbia Ltd.; J. W. Hamilton, director, Imperial Oil Ltd; J. K. Jamieson, director and vice president, Imperial Oil Ltd.; J. G. Spratt, president Anglo-Canadian Oil Company Ltd.; I. G. Wahn, attorney, Borden, Elliot, Kelley, Palmer & Sankey, secretary; and W. J. Wilkins, member executive staff Gulf Oil Corporation.

The administrative staff is headed by H. H. Anderson, Vancouver, vice president and general manager; and includes S. M. Blair, Toronto, vice president; A. F. Terrill, assistant general manager; Derrick Humphreys, assistant to vice president and general manager; and R. E. Fleishman, secretary to vice president and general manager. Headquarters of the operating organization are at Vancouver, British Columbia.

Members of the engineering staff are C. D. Bailey, chief engineer; T. A. Haslett, operations engineer; J. S. Gray, communications and electrical engineer; K. L. Hall, mechanical engineer; G. I. Russell, corrosion engineer; J. Bos, civil engineer; and R. D. Batt, drafting-surveying supervisor.

Completion of this important engineering work is certain to have a powerful influence upon the future economic development of Canada, not only by providing new markets for the expanding oil production of the prairie provinces, but also by stimulating the industrial growth of the territory it serves. It will attract manufacturing plants, provide the energy needed for utilization of the great natural resources of the area, and bring to western Canada the population which is the only factor lacking in its equipment for economic greatness.



Ditching machine on right-of-way of Trans Mountain line between Vavenby and Avola, B. C.

Scraper trap on Trans Mountain pipe line near Blue River, B. C. Many of the photographs with this article are reproduced through the courtesy of Richard Finnie, Bechtel historian.

In the half century since cement first was lowered into boreholes in an attempt to shut off water, cementing service has kept pace with drilling complexities by improvements in equipment and chemical research.

The Silent Service

By Grover Kilgore

Grover Kilgore, vice president of the Halliburton Oil Well Cementing Company, Duncan, Okla., has spent his entire active business life with this one company. After his graduation from Duncan high school he majored in geology at the University of Oklahoma before joining Halliburton as a truck driver in 1926. He has held most of the jobs available in the company: cementer, field man, assistant superintendent, contact man, sales manager and now vice president in charge of all sales and advertising. Recently he took a postgraduate course in Harvard's School of Business.

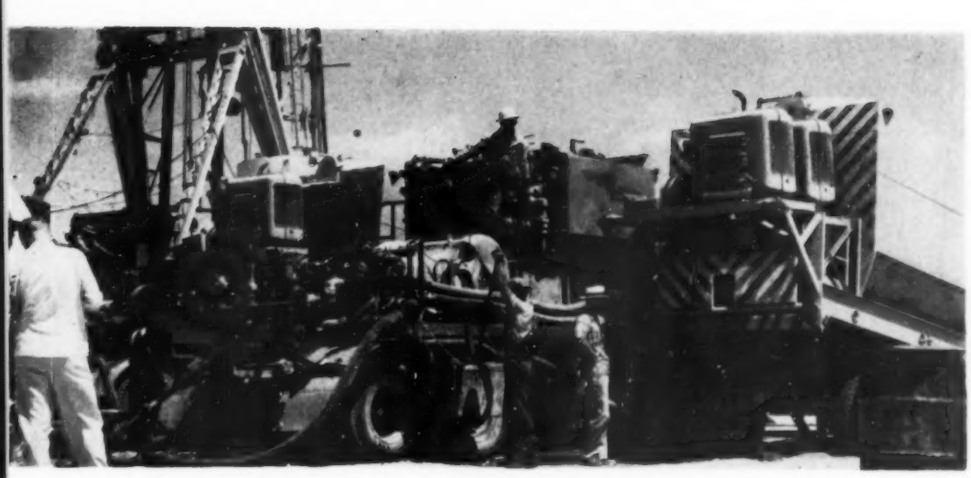
OIL WELL CEMENTING companies represent a relatively small segment of the service organizations that assist the petroleum giant in its recovery of oil. Cementing might be termed the "silent service" because so few persons outside the industry are conscious of its existence. In fact, even within the industry, there are some —mainly those not directly connected with field operations—who are only faintly aware of the scope of its activities.

Yet oil well cementing plays an integral role that affects everyone in the industry including riggers, drillers, operators and stockholders. Ultimately, it affects all petroleum products by assisting in the greater recovery of oil.

To the average citizen, cementing of oil wells still smacks of pure fiction. To him, cement is something you use to build highways or to pour into building foundations. Probably he'd be considerably surprised to learn that men have been cementing oil wells since about the turn of the century. True, there were no cementers around when Gen. Andreas Pico was dredging up a tarry substance in the San Fernando Valley in 1855, nor even a few years later, when the first strike was officially recorded at Titusville. But there wasn't much need for a cementer at that time.

Early oil wells were drilled to such shallow depths that water infiltration failed to present any problems for operators. But stepped-up demand for petroleum products meant increased digging to greater depths. The matter of infiltrating water became an unpleasant reality.

There's no record of any plaque being nailed up to honor the first man who attempted to plug off water by lowering cement-filled sleeves to the bottom of the sand line. At any rate, his efforts were unsuccessful. But they paved the way for attempts that met with partial success by dumping or lowering the cement



A cementing operation in West Texas. At the right is a field storage bin discharging cement into the mixer, a T-10 cementing trailer. A second storage bin is at the left of the mixer. Man at the right is controlling cement discharge from the hopper. Next to him a second man is controlling consistency of the cement slurry. Man standing on the mixer is at the control panel.

into the wells in light tin containers.

Operators remained skeptical, however, even three and four decades ago when the cementers of that day showed up with their horse-drawn wagons and crude equipment, determined to prove that a good cementing job around the casing would boost a well's productivity. How well they succeeded in furnishing proof is apparent today, with cementers on the scene wherever oil is drilled.

Cementing an oil well sounds like a simple matter to some persons. Just pour cement down the hole and wait for it to set. And a simple definition tends to bear out that belief. It is the "practice of mixing cement and pumping it into certain places in the well for the purpose of shutting off water or excess gas. It is pumped either into the annular space behind the lower part of a string of casing or into a permeable formation."

A more complete definition of what successful cementing involves presents a truer picture and is of greater interest to men who are paying for these vital services.

There are two general cementing procedures used during the lifetime of a well, usually referred to as primary and secondary:

Primary cementing of casing is expected to (1) provide a permanent shutoff regardless of formation; (2) protect producing formations from upper water; (3) protect casing, where cemented, against collapse from external pressure; (4) prevent corrosion; (5) prevent shifting formations, the cement forming a tight seal between hole and casing; (6) prevent migration of fluids from one formation to another; (7) prevent a blowout from high pressure gas behind the cemented casing; (8) protect and conserve shallow productive sands behind the casing; (9) allow swinging the casing any distance from bottom, instead of the old method of making a seat, and (10) protect shallow fresh water sands used for domestic water supply.

Secondary cementing deals with completions and remedial work to a well after the primary job has been completed.

These are the goals of successful cementing. But it takes more than wishful thinking to achieve them. Accomplishing them takes sweat, know-how and capital.

To say that cementing an oil well never has been regarded as gold-bricking by anybody who has ever done any of it, is putting it mildly. It was an especially rugged pastime in its fledgling days when cement was mixed and poured by hand. And a number of today's top executives in the cementing business have sharply-etched memories of the old boom-town days when they slithered down muddy roads with their equipment, driving open-cab trucks when icy winds bit deep, emptying, mixing and pouring up to 500 sacks a day by hand.

Today's cementing operations are a bit easier on personnel, but it's still no soft touch. In addition, modern-day operations call for greater skills and know-how to solve the complexities created by greater depths and pressures, by varied downhole conditions in widely-separated fields and by the growing need to pare down production costs while boosting output.

To achieve success, cementing firms must keep on the move. These companies exist and progress by approval of the petroleum industry and they can't afford to sit still. Rapid technological changes and developments in the petroleum field, one of the world's liveliest enterprises, make it impossible for any one branch of service to lag behind and still deliver satisfactory performance.

Cementing not only keeps pace with the progress of the industry, but generally anticipates its needs before they are known. And down through the years the dominant guiding principle of the cementer has remained the same: to provide operators with reliable, uniform service at a reasonable cost.

How has this service been able to match the industry's progress? One answer is its continuous, energetic research program; another is its personnel.

Cementers are not just men who happened to be handy when a job opening occurred. They are hand-picked, high-caliber men, trained and skilled in the performance of their duties, possessing a large degree of authority to make decisions in the field. The vast majority of them have been trained by the old-timers, men who know every phase of the cementing business and who have a wide practical knowledge of the entire industry.

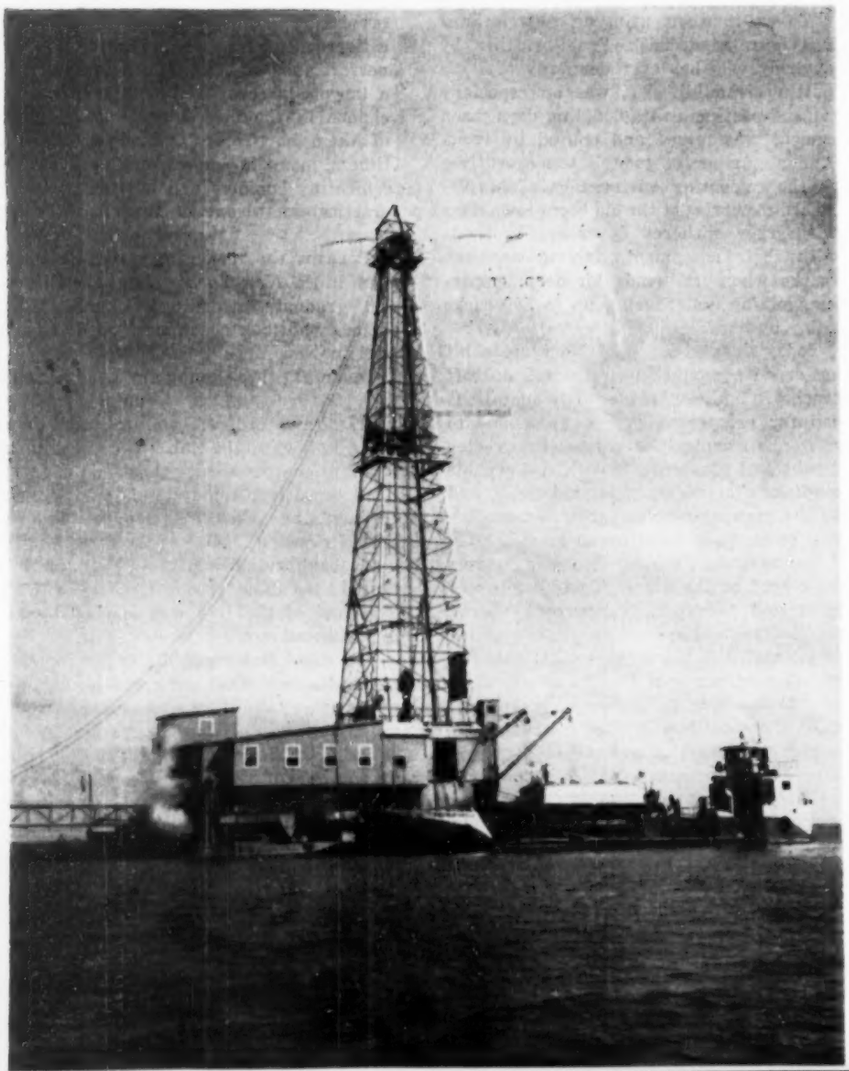
Perhaps the reader may recall a short item in the *New Yorker* about the Princeton graduate attending Columbia Law School who took a summer job driving a taxi in New York.

One night three young Ivy League products flagged him down outside a restaurant and ordered him to take them to an uptown night club. They kept up a running chatter about school and country until the driver could stand it no longer.

"Say," he asked, "Aren't you fellows from Princeton?" One of the fares flipped out a haughty affirmative. "Thought so," mused the cabbie. "So'm I. Class of '50." The rest of the trip was marked by an unbroken silence.

You could find a parallel in the cementing business. That junk hustler sitting up in the cab of the cementing truck might have a Phi Beta Kappa key in his pocket. Or he may have taken top honors at one of the country's leading engineering schools. You'd find that a high percentage of today's cementers, including top engineers and scientists, have had concrete field experience to back their theo-

Cementing a long string near Houston. Some of the heaviest equipment used in the industry is operated in the Gulf Coast where deep, high pressure wells are common.



One of the 12 cementing craft operated by Halliburton for marine cementing. It carries its own bulk cement and has crew quarters and all necessary supplies for independent operation.

retical training. Many of today's cementing executives started out as helpers and drivers.

Field personnel are back-stopped by equally competent specialists in the laboratories and engineering departments. These technicians, numbering some of the nation's best engineering brains, supplement field operations with a never-ending program of testing and development of new tools, materials and methods.

Tools designed to carry out highly-specialized tasks don't just happen. The efficiency, economy and safety factors built into each of them and their ability to assist in increased recovery of oil represent years of experimentation and testing.

They say tomorrow is no secret to the scientist, and the engineers and chemists working in the laboratories of cementing companies are no exception. They devote a great amount of time to pure academic research that makes tomorrow better. In addition, these specialists and their equipment are available to the industry without charge, to work on stubborn field problems met by operators and drillers.

As to personnel, it is interesting to note that, despite the difficult conditions under which cementers work, labor difficulties have been at a minimum. Profit

sharing and hospitalization plans, regular paid vacations, advancement within the companies and careful selection of employees have contributed to the spirit of co-operation and willingness to tackle tough jobs.

Equipment also plays an important role in the uniform service offered by cementing firms. Men and their gear must be equally rugged to roll up more than five million miles a month.

Flagship of the Halliburton marine cementing fleet, the Halliburton 206, which was commissioned as the first ocean-going cementer in July 1953.

The rickety horse-drawn wagon has given way to super heavy-duty trucks equipped with modern high-speed pumps and special tools—in reality laboratories on wheels—that penetrate wherever the free world digs for oil. Sack cutters, bulk cementers and accurate new measuring devices (in lieu of the old clothesline) represent just a few of the many new tools and methods developed to aid the flow of oil.

Bulk cement is only a dozen years old commercially, yet it now accounts for a majority of all cement handling, rising to about 276,000 tons in 1952 in the United States alone. Use of bulk cement methods has permitted tailoring of cement to the individual well by the addition of a variety of materials to the dry cement as required.

In particular, the jet mixer proved to be an important innovation when it was introduced in the early 20s, replacing the old method of mixing and pouring by hand. Today, a lightweight, twin-jet, high-speed mixer is capable of mixing up to 4,000 sacks of cement an hour.

Hydraulic retrievable cementers and packers represent but a few of the improved tools in use today. Squeeze cementing, perforating, multiple stage cementing, and hydraulic fracturing are just a few of the newer remedial techniques.

Not so many years ago, cementing equipment was capable of developing about 3,000 psi. Today this has been built up to 10,000 psi and above. With the development of drillable squeeze packers and hydraulically actuated removable packers, the success of squeeze jobs has been quadrupled.

The diversity of the jobs modern-day cementers must tackle places a surprising burden on this equipment. For example, it is used to (1) cement surface, intermediate, and production strings of casing; (2) determine location of leaks in split casing; (3) cement off leaks; (4) measure well depths accurately; (5) plug back to shut off bottom hole water; (6) plug off crevices, cavities and thirsty formations that shut off circulation; (7) plug back for side-tracking purposes; (8) break circulation around casing or stuck drill pipe by means of pump pressure applied to circulating fluid; (9) kill wild wells by means of pump pressures; (10) fight oil field fires; (11) mix drilling fluid materials; (12) mix cement admixes; (13) consolidate loose sand formations; (14) pressure-test casing, connections and pipe lines, and (15) fracture formations.

New materials also have been evolved. Pozzolanic materials, improved chemical solutions and tailor-made cements have been developed with a view to providing superior service. Chemical improvement in cements has been continuous. Research by cementers has revealed data of great value about cement dehydration and cement retardation. To aid the cement chemist, equipment has been developed to survey down-hole temperatures and to caliper the bore. Laboratory research with the consistometer has revealed facts about pumpability of cement under various conditions and setting times which have taken the guesswork out of field operations.

Maintenance of equipment is vitally important in this field of endeavor and cementing companies work hard to keep their equipment rolling. This equipment is extra-sturdy, but the harsh treatment it receives necessitates maintaining machine, repair and major overhaul shops. The fleets of thousands of trucks, ranging from sturdy pickups to super cementers, the barges and planes—all must have periodic checkups and repairs. In addition, field divisions must be equipped with adequate repair shops and must stock parts, tools and materials in quantity.

It isn't much of a secret to point out that cementing firms exist to make a fair profit. Their success or failure depends on the demand for their services, and on their ability to deliver reliable service at reasonable cost. To meet that challenge they provide top-flight personnel, special tools and dependable equipment, and offer service on a round-the-clock basis, seven days a week. And yet, essential though these services are, they represent but a small percentage of the total cost of drilling a well.

Service remains the lifeline of existence for the oil well cementing companies, and they find it good business to provide uniform service for all customers, small or kingsize. For example, cementing trucks have rolled up to 700 miles to tackle a single job for a small operator. In addition, like other competitive organizations that serve the industry, the cementing companies stand ready with men and equipment to support oil field crews to the hilt in emergencies.

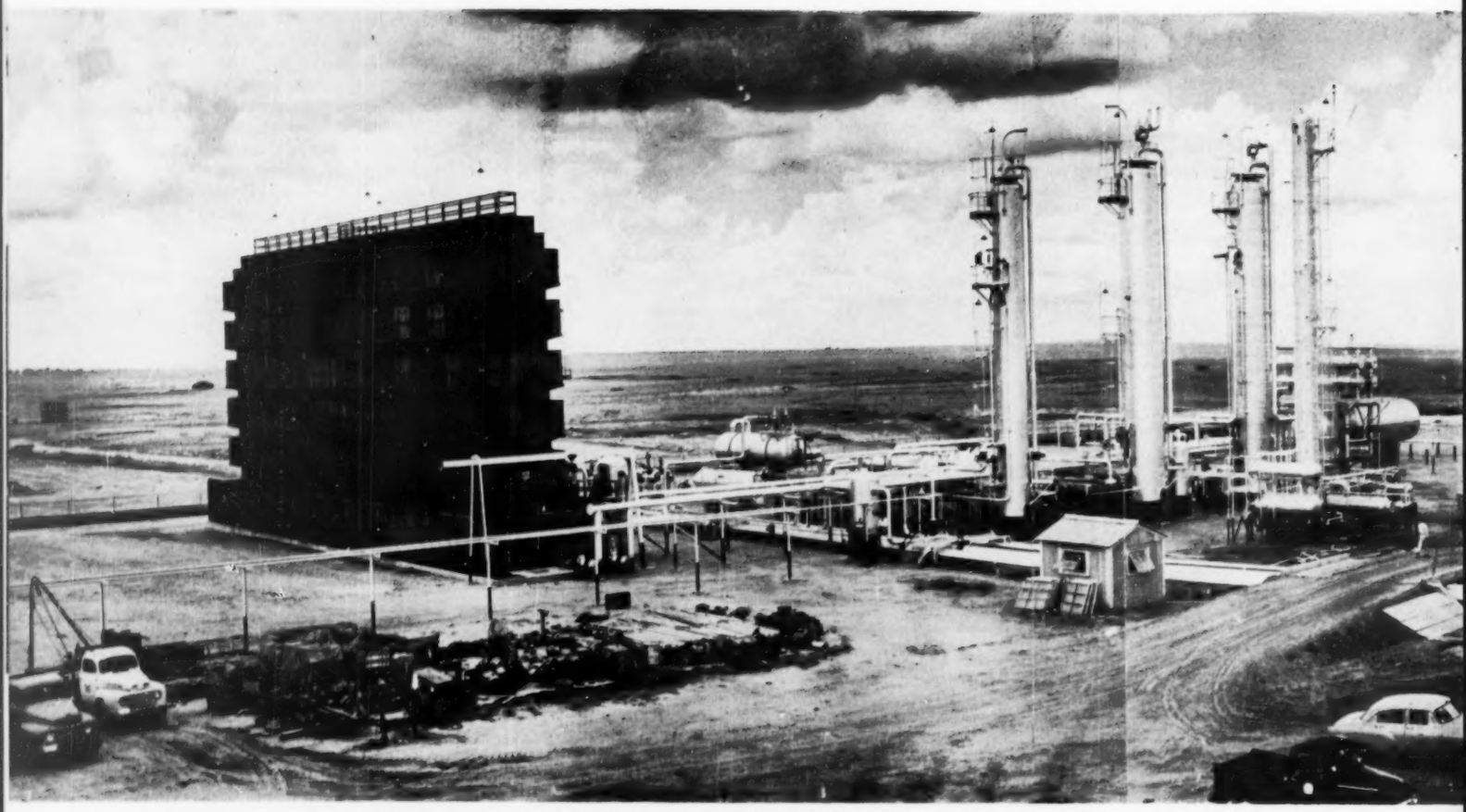
That's a rough picture of the cementing business, its goals and achievements, past and present. But what of tomorrow?

In the future, cementing companies will attempt to enlarge their continuing program of improved service, of anticipating the needs of the industry before they become realities.

These firms are facing increasingly complex problems of temperatures and pressures by expending more time, sweat and capital on their extensive, energetic research programs.

They are experimenting with tools, materials and methods that will deliver top performance from Alaska to Saudi Arabia, wherever men seek oil. They are investing in tomorrow in an effort to deliver uniform, reliable service at reduced cost to the operator.

They are striving to be taken for granted—one of the highest compliments which can be paid to the supplier of any service.



West Guara pressure maintenance plant which supplies gas to all wells producing by gas lift and to all pressured reservoirs. Photograph was taken as a seventh compressor was ready for uncrating and installation. When the new compressor is in place the plant will handle 30 million cubic feet of gas daily. Creole Petroleum Corp. and Mene Grande Oil Co. are owners; Mene Grande is operator.

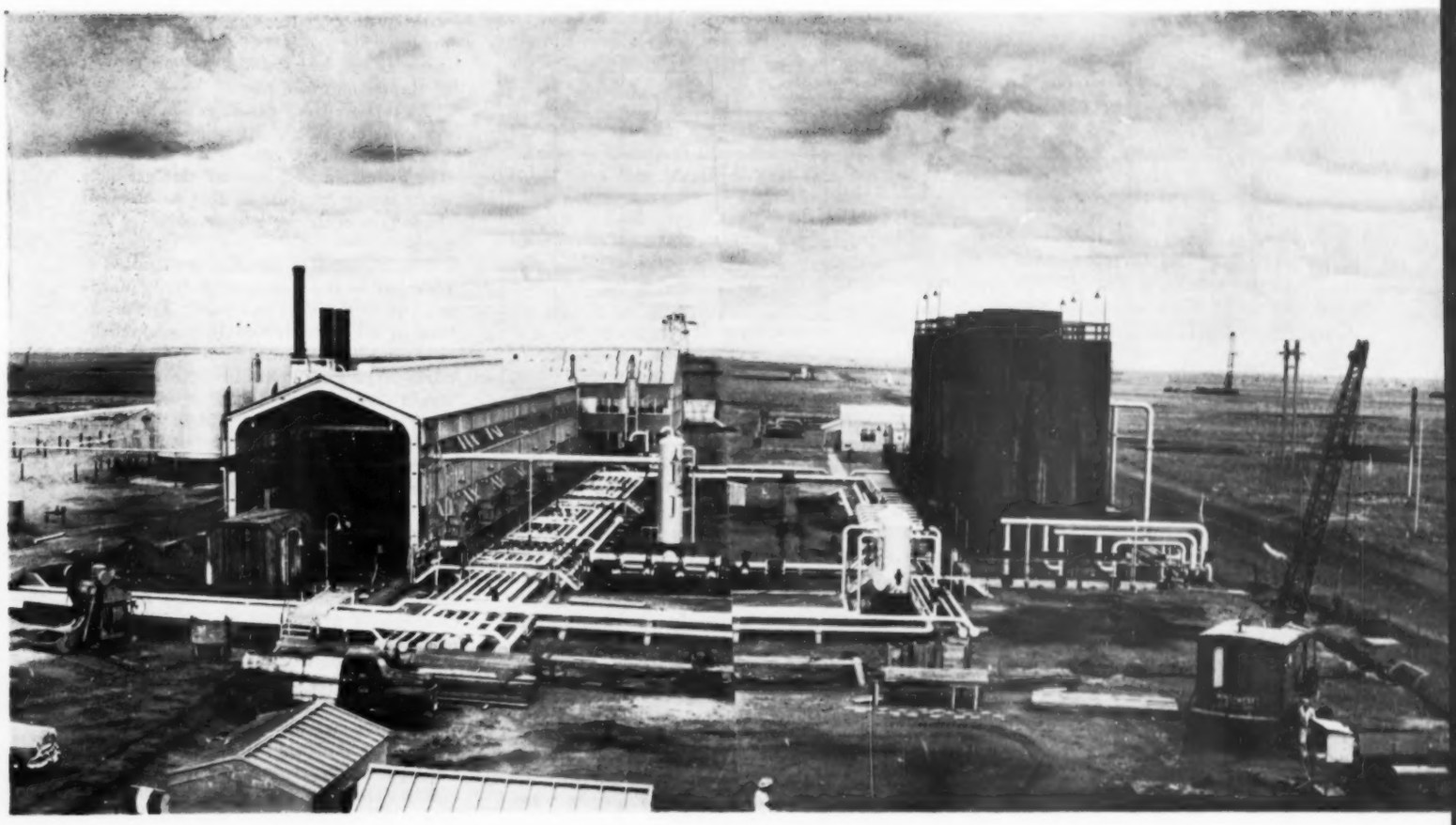
Pressure Maintenance in Eastern Venezuela

By Eugene F. Prestera

Eugene F. Prestera was born at Bradford in the heart of the Pennsylvania oil fields. His first oil experience was with Ryder & Scott, consulting secondary recovery engineers. This was before his military service as a paratrooper in World War II. After his return from the war, Mr. Prestera completed his engineering education at the University of Pittsburgh. He roustabouted in Wyoming for Continental Oil Co. until the latter part of 1950, when he joined Mene Grande Oil Co. in Western Venezuela. He first served as a drilling and mud engineer and company supervisor of contract work, transferring in 1951 to Eastern Venezuela where he joined Mene Grande's reservoir engineering section.

IN VENEZUELA, day by day results are being received to substantiate the value of pressure maintenance, not only in increased ultimate recovery and shorter depletion periods, but in conservation of natural gas through its reinjection into producing sands.

Early in the 1940s, Mene Grande pioneered in what was probably the first attempt at pressure maintenance in Eastern Venezuela. The first project simply utilized gas from a high pressure sand in its natural state and through differences in pressure it was injected into a shallower, lower pressure sand. There were no compressors used. Although meager in its expanse, this project nevertheless indicated that Mene Grande's engineers were already planning for a future pressure maintenance program. No startling re-



sults came of this project, but studies were continuing in an effort to attain the most efficient production without detrimental effects to the reservoirs.

In 1945, the original recommendation for pressure maintenance on a large scale in Venezuela was submitted by Doctors Muskat and Wescott of the Gulf Research and Development Company, who were assisted in their studies by the reservoir engineers and geologists of Mene Grande. This recommendation involved reservoirs in the West Guara Field.

The reservoirs chosen were partly on acreage solely-owned by Mene Grande and partly on acreage held jointly with the Creole Petroleum Company. Agreement on the same terms of unitization was reached by Mene Grande and Creole and immediately plans were drawn for a compressor plant.

The plans called for a compressor plant capable of injecting 25 million cubic feet of gas daily into the initial gas caps of four or five of the larger West Guara reservoirs. It was intended that a sufficient volume of gas would be injected to retard the decline of pressure at the then current production rates. Facilities were also provided for stabilizing the natural gasoline liquefied during gas compression.

While the West Guara plant was being constructed, plans were formulated for other pressure maintenance installations. The West Guara plant was placed in operation in March 1948, the Oficina plant in October 1948, and the Santa Barbara pilot plant in 1949.

A program of pressure maintenance and conservation evolved which was unequaled in Venezuela, and one of the finest in the petroleum industry. This was voluntarily instituted by a company which, while furthering its own interests, was conscientiously utilizing and developing the natural resources of Venezuela.

By the end of 1953, there will be operating under Mene Grande's supervision in Venezuela 18 gas-injection and three water injection projects in Chimire, Nipa, Oficina, Mapiri and West Guara fields.

Considering the quantity of gas and its inherent energy which formerly would have been lost and which will now be used to sustain the producing life of the reservoirs, it can be seen why Venezuela is proud of her petroleum industry, and the great strides it is making.

It is not the purpose of this article to delve technically into the mechanics of pressure maintenance nor the characteristics of the individual reservoirs into which fluid is being injected, but to give sufficient information to illustrate the degree of success experienced on some of these projects.

Oficina Field

Gas is being injected into four reservoirs in the Oficina field. They are the D and A segments of the L_1 sand and J_1 and F_1 (CE segment) sands.

The L_1 sand of the D segment is a "channel" sand varying from 0 to 70 feet in thickness and is at an approximate depth of 5,000 feet. Accumulation is accounted for by the thinning of the sand on its lateral edges, faulting at the updip extremity and an oil-water contact downdip. Drilling began in this area in 1940, and the original pressure was 1,910 psi. Before gas injection was initiated in 1948, the reservoir pressure had declined to 1,060 psi with 25 percent of the oil initially in place having been produced. Forty-nine percent of the wells were pro-

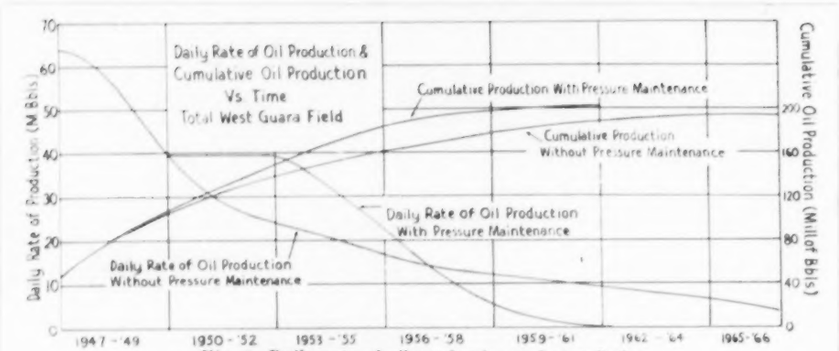

Daily Rate of Oil Production & Cumulative Oil Production Vs. Time Total West Guara Field
Cumulative Production With Pressure Maintenance
Cumulative Production Without Pressure Maintenance
Daily Rate of Oil Production With Pressure Maintenance
Daily Rate of Oil Production Without Pressure Maintenance
Daily Rate of Production (M Bbls)
Cumulative Oil Production (Mill of Bbls)
1947 - '49
1950 - '52
1953 - '55
1956 - '58
1959 - '61
1962 - '64
1965 - '66

Fig. 1: Daily rate of oil production and cumulative oil production vs. time, total West Guara field.

ducing by artificial lift, and reservoir potential was declining some 12 percent each year at a production rate of 230,000 barrels per month. These signs all indicated that the total ultimate recovery would amount to about 37½ percent, leaving some 62½ percent of the original oil still in place in the reservoir. By gas injection, a recovery of 39 percent was expected. In October 1948, gas was first injected into this reservoir at a rate of 10 million cubic feet per day and the injected volume was gradually increased to 15 million cubic feet per day. Injection is through five wells into an initial gas cap. Reservoir pressure has increased to 1,160 psi and withdrawal rates are equal to those of 1948. With wells again returning to natural flow, the estimated ultimate recovery has been revised upwards to 41½ percent of the oil initially in place. When this reservoir has ceased to yield oil, it will contain approximately 64 billion standard cubic feet of gas stored at a pressure of 1,200 psi.

The L_1 sand of the A segment is also a "channel" sand varying from 0 to approximately 40 feet in thickness at a depth of 5,800 feet. This is an extension of the L_1 sand of the D segment, but is separated from it by faulting. Within this segment the L_1 sand is partially faulted, which accounted for a great variation in bottom hole pressures initially encountered.

Drilling began updip of this local fault in 1940 and initial bottom hole pressures were about 2,100 psi. As the number of outlets increased, so did withdrawal rates; consequently, reservoir pressure began to fall immediately, and by 1948 had declined to 1,300 psi. Also in this year, drilling commenced in the downdip oil leg below the local fault and surprisingly low bottom hole pressures of 1,350 psi were observed. This was 750 psi below virgin pressure of the updip leg and indicated that the sand was not entirely faulted across. In 1951, when injection into this reservoir began, the pressure had declined to 1,000 psi in the downdip section and to 1,200 psi in the updip section, with only 7.9 percent of the initial oil in place produced. Injection rates have been approximately 1,500,000 cubic feet per day into the initial gas cap.

Today, with the pressure building up in this reservoir, a number of wells have again become natural flowing outlets. The pressure has actually risen 150 psi updip and 50 psi downdip. Recently, another well was placed in injection service below the local fault to give a more balanced injection pattern and aid the pressure buildup in this tight section.

In the $J_{1,}$ sand, also a "channel" sand with an average thickness of 20 feet, the pressure has dropped 500 psi below virgin pressure and has yielded only six percent of the initial oil in place.

At this writing, gas injection into the reservoir has just begun at a rate slightly less than 2,000,000 cubic feet per day, and it is estimated that through this pressure maintenance program 25 percent more oil than previously estimated will be recovered.

The F_5 sand in the CE segment is a reservoir of the stratigraphic type pinching out to the east and west. Accumulation of oil is controlled by these pinchouts and the Oficina fault cutting the north-dipping structure to the south. The virgin pressure was 1,725 psi and it has since dropped 28 percent while the sand yielded 17 percent of the initial oil in place. An extensive study was recently made of the F_5 sand and a recommendation submitted for gas injection even though the original estimated oil to be recovered without pressure maintenance was 42 percent. Gas injection into this F_5 sand was begun six months ago and indications of a pressure rise in this segment have already been observed.

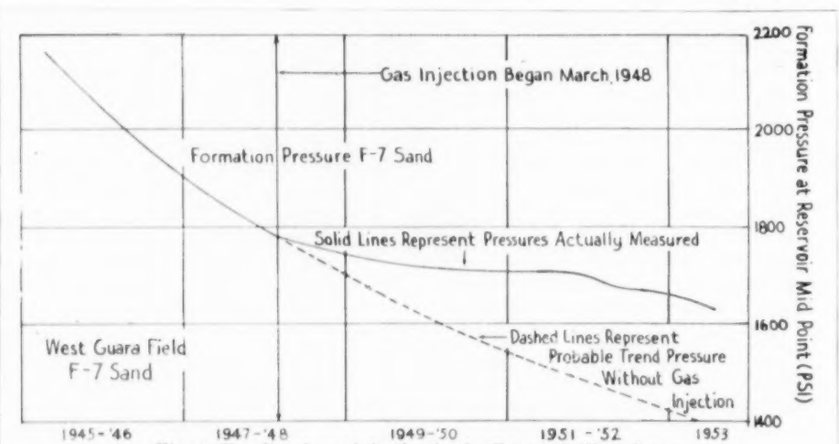


Fig. 2: Results of gas injection in the F-7 sand, West Guara field, since the operation was undertaken in March 1948.

West Guara Field

The majority of the productive sands of West Guara are more or less continuous throughout the field with some localized development occurring. The strike of the beds is generally east and west and dip downward to the north. The oil trap is formed by the arcuate south-dipping Guara fault cutting these sands. West Guara, with some 50 sands of a variety of characteristics, posed quite a problem of well completion. In the development it was decided to open these sands individually to production rather than expose several of them simultaneously. Then, to hold to a minimum the number of wells required to produce the oil in these sands and to utilize to the utmost the available steel during the war years, multiple zone completion was practiced with the individual zones separated by packers. As the field developed and withdrawal rates increased, it soon became evident that the reservoir pressures were declining at such a rate that natural flow would cease in the casing and annulus zones of these multiple zone producers long before the potentially recoverable oil could be produced. Therefore, the multiple zone wells would necessarily become single zone producers because it would be impractical to use artificial lift in the casing and annulus zones simultaneously.

The cessation of natural flow would extend the period of depletion or require the drilling of additional outlets, thereby defeating the original purpose of the multiple zone wells. Gas injection would pay for itself if it maintained natural flow in the annulus zones even though no increase in ultimate recovery resulted.

The Oficina $6_{,}$ sand is the shallowest of the West Guara field sands into which gas

is being injected. It is approximately 4,700 feet below the surface, has an average thickness of 34 feet and initially contained a small updip gas cap. In 1945, when the first outlets of the Oficina 6_u sand were opened, a bottom hole pressure of 1,700 psi was encountered. By 1948, eighteen percent of the initial oil in place had been produced and reservoir pressure had declined to 1,525 psi. This was only a ten percent drop in pressure with an 18 percent yield, an efficiency primarily due to an active edge water drive. The Oficina 6_u sand, being shallow, naturally had many outlets in the annuli of multizone wells, and the necessity of maintaining pressure in this reservoir became more apparent as it became more difficult to sustain natural flow in these zones.

For this reason, gas injection into this reservoir was begun in 1948 at a rate of three million cubic feet per day. Today, the reservoir pressure is 1,540 psi, 38 percent of the initial oil has been produced and injection into this reservoir has been terminated. Although currently there are only three producing outlets, the ultimate recovery is expected to reach 45 percent.

The Oficina 11 sand occurs at a depth of approximately 5,000 feet and has an average thickness of 22 feet. This sand is badly interbedded by shale and its permeability is generally low. It produces oil with an average gravity of 51° API, the highest in the field. When the reservoir was first penetrated, it was found to contain undersaturated oil, consequently the pressure declined rapidly as withdrawal rates increased. Nineteen of the original 24 outlets were casing or annulus zones and here again, the difficulty of maintaining natural flow was occurring; also encroaching water created a sanding condition as it reached the well bores. In 1948, gas injection updip into the Oficina 11 sand reservoir was initiated, and in an attempt to obtain optimum pattern efficiency in this shale-broken sand, three injection wells were used. By the time pressure maintenance began, the pressure had declined approximately 20 percent from virgin to 1,460 psi, while the reservoir had produced about 20 percent of the original oil in place.

Initial injection rates were approximately 1,700,000 cubic feet per day. As was expected, the gas began to channel somewhat and a number of producing wells had to be closed in. The uneven front of the encroaching water forced the closing of other wells and finally there were only three productive outlets. In January 1951, the water drive was found to be sufficient to maintain pressure and natural flow in these few outlets; consequently, gas injection was discontinued. Today, however, with six outlets producing, gas is again being injected into the Oficina 11 sand and the pressure is 1,590 psi. As injection continued to prove effective, the estimated ultimate recovery figure has been revised upwards from 42 to 50 percent. This reservoir has now produced almost 45 percent of the initial oil in place.

The D-3 sand, in general, is quite uniform and continuous throughout the field. It has an average depth of 5,415 feet and has a net thickness of 46 feet. Generally, there have been some 20 outlets producing from this sand, of which most were casing or annulus zones. Before gas injection was started, the bottom hole pressures in the outlets had dropped 345 psi (17 percent from virgin) and the reservoir had yielded 17 percent of the initial oil in place. Because the well-head pressures were approaching the critical point where it would be difficult to maintain the casing and annulus zones on natural flow, it was decided to maintain the pressure in this sand by gas injection. Initial injection rates were about four million cubic feet per day, and currently are 6,500,000 cubic feet per day. Since injection began in 1948, the pressure has declined 40 psi, during which time the sand has produced 19 percent of its original oil. Even though there are only 13 outlets presently producing, it is probable that the originally estimated recovery figure of 50 percent will be attained.

The F-5 sand is the largest reservoir in areal extent of the West Guara field. Lying at a depth of 6,000 feet, it contains two members, both continuous throughout the field and separated by a three-foot shale streak. The reservoir is made up of siltstone and slightly calcareous sandstone with fine lamination of black carbonaceous material. It contained an initial gas cap and exhibited indications of an active water drive. From the beginning, the flowing characteristics of the wells in this sand have shown it to be non-uniform and tight, although the measured value gave it an average permeability of about 100 millidarcys.

The first outlets of the F-5 sand were opened in 1945 and the virgin pressure was found to be 2,260 psi. In 1947, with 13 outlets, this sand reached a maximum daily production of 3,300 barrels. It soon became evident that the influx of water was not advancing uniformly and had been detrimental rather than helpful to the reservoir. By 1951, there were four outlets flowing clean oil, three flowing wet oil and four wet oil zones on gas lift. The reservoir had produced six percent of its original oil content with an accompanying pressure decline of 800 psi and it was becoming increasingly difficult to maintain the wet oil producers on natural flow. With these obvious detrimental effects occurring in the reservoir, a recommendation was made to inject gas in an effort to retard the pressure decline and decrease the water entry. Pressure maintenance of this reservoir began during the middle of 1951 and although the gas has channeled somewhat, the pressure decline has been retarded slightly even though nine wells are producing from this sand.

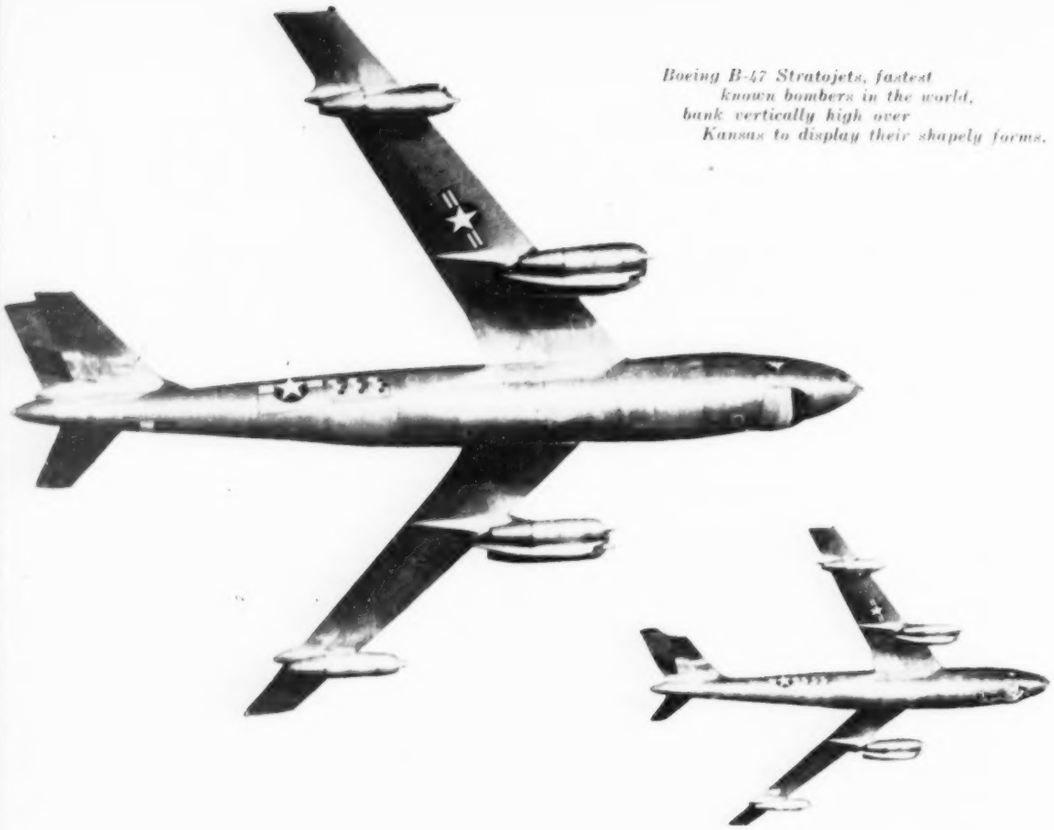
Today 14 percent of the initial oil in place has been recovered and should this gas injection program continue to prove successful, there is a possibility that the potential 20 percent recoverable oil will be produced.

The F-7 sand is by far the largest reservoir in West Guara in regard to proven reserves, and it accounts for roughly 22 percent of the field's entire production. It occurs at 6,020 feet below the surface of the ground and varies from 30 to 100 feet in net sand thickness, except to the West where it thins rapidly to two small stringers. In their original completion, the majority of F-7 sand outlets were casing or annulus zones. The F-7 sand had only a weak edge water drive, and prior to gas injection it had produced 18 percent of its initial oil volume while declining some 400 psi from virgin pressure.

Since the inception of pressure maintenance in March 1948, injection rates have averaged 10 million cubic feet per day. The total pressure decline has been only 70 psi, while the reservoir has produced an additional 20 percent of the original oil in place. Calculations have been made which show the trend of the pressures had the withdrawal rates and water influx remained essentially the same. In the accompanying diagrams a graphic representation of the reservoir performance under these conditions is shown. It can easily be seen that, without the assistance of gas injection (Figure 2), the formation pressure would now have been some 200 psi below its present level. Of particular significance are the casing and annulus well head flowing pressures, plotted against time, without pressure maintenance. Had gas injection not been utilized, the casing pressures would now be substantially below the 150 psi minimum at which natural flow can be assured, thus all casing outlets would have been eliminated. It is also doubtful whether the annulus zones would be flowing, especially if they were producing with any appreciable water cuts. Currently there are 30 outlets from the F-7, 13 of which are casing zones. Through a pressure maintenance program, the depletion of this reservoir will occur in approximately seven years less time than had it produced by a natural pressure decline. The ultimate recovery from the F-7 sand was estimated to be 57 percent with gas injection, and from all indications this figure should be attained.

The L-2 sand is the smallest reservoir of the West Guara field undergoing a pressure maintenance program. It consists of three lobes, into the largest of which gas is now being injected. At the initiation of gas injection, all outlets in this sand had ceased to flow with one exception—a tubing zone. The bottom hole pressure had declined to 1,650 psi, ap-

(Please turn to page 127)



Boeing B-47 Stratojets, fastest known bombers in the world, bank vertically high over Kansas to display their shapely forms.

A look at aviation's future

Condensed from an address by Lieut. Gen. James H. Doolittle, vice president, Shell Oil Company, before the National Petroleum Association, September 16, 1953.

THE HISTORY of heavier than air military and civil aviation begins with the first flight by the Wright brothers at Kitty Hawk, North Carolina, 50 years ago on December 17, 1903. It was one of the great events in history. A few individuals sensed its value, but the U.S. Government was slow to take flying seriously. The U.S. Army did not advertise for bids for an airplane until 1907, and then their skepticism was indicated by the specifications which required that the plane be built so it could be taken apart easily for transportation by horse and wagon. As late as 1916, when General Pershing went into Mexico after Pancho Villa, the entire tactical airforce consisted of only 13 planes. They were not suited for the job Pershing had to do, and the expedition had virtually no air support. In World War I our pilots were magnificent but the story of our own American-built aircraft is not a pretty one.

European nations moved faster. The French and English took up aviation enthusiastically. A decade after Kitty Hawk, the Germans were mass-producing military-planes. These planes and others built soon afterwards by both sides served in operations that led to the modern concept of military aviation.

The evolution came in three phases.

First, the plane was the eyes of the army, an aid to scouting. In it a man could fly over the enemy lines and see what they were doing.

In the second phase, the plane became a type of long range artillery. Where a gun could throw explosive shells only a few miles, a plane could carry bombs many miles farther and drop them on enemy targets.

The third phase, which has far-reaching implications, came about like this: in the early days of the war Allied and German pilots used to pass one another on missions and just wave. Then one day a pilot took his .45 along and used it. That started a trend that moved quickly through the use of rifles to the mounting of machine guns on planes. The aerial duel came into being and with it came the concept of obtaining and retaining control of the air, the ability to do your job

Lieut. Gen. James H. Doolittle

United States Coast Guard helicopter passing the east side of the United Nations building in New York. U. S. Coast Guard photo.

and, at the same time, to keep the enemy from doing his. Control of the air has become the first pre-requisite to successful ground, sea or air operations. Today our air-atomic offensive power is the greatest deterrent to war and our primary weapon in case a war is forced upon us. An adequate air defense of the United States is essential to surviving a large scale air-atomic attack.

There was no strategic air war, in its modern sense, in Korea. This is because the Air Force was not authorized to strike at the source of the communists' productive and war making potential, and so destroy their ability and will to wage war. These important targets were beyond the Yalu. Our major air effort was spent in support of the ground troops. The most significant air contest in Korea was between our best fighter, the F-86 Sabre Jet, and the Russian's best, the MIG-15. They outnumbered us about four to one. They had the advantage of location and sanctuary behind the Yalu. At the beginning of the war our ratio of victories was nine to one. By the end of the war it

Four steps in the development of commercial aviation in the U. S.: the famous "DC-3" is in the background and the new DC-7, soon to go into service, in the foreground. Between are the DC-4 and the DC-6. The new DC-7, with a cruising speed of about 365 mph, will go into non-stop service between New York and California later this month. The trans-continental flight will require less than eight hours.

had risen to over fourteen to one. There are several reasons for this. One is the ruggedness and performance of our planes. Another is the superiority of our gun sights. A third is the excellent training of our pilots. And a fourth is the greater experience and skill of our pilots. We kept them on the job longer than the Reds kept theirs, and our men, inherently good, became increasingly effective. The Reds used Korea as a training ground, so their pilot turnover was fast.

Without control of the air in Korea, our military position would have been precarious, if not impossible, and the result for the free world could have been grave.

The same historic flight, in 1903, that gave rise to modern air power, also led to the development of civil aviation. The Wrights and a few others saw the potentiality of the airplane in a civilian economy, but the concept was hard to sell. Growth came in several stages.

First were the traveling air carnivals. They contributed to the growth of civil aviation by arousing the curiosity and interest of thousands.

The second phase came with the air races, which also helped to promote interest in aviation; and the spirit of competition provided money required for the advancement of the art.

The third major distinct contribution consists of famous flights.

There are other elements in the story. A few weeks ago I was asked to list what I considered the ten most significant events in the last 50 years of aviation. The list, which includes four famous flights and six other events, is a capsule history of progress. You will notice that not all the items can be tagged "Made in the U.S.A." The list, chronologically, follows:

(1) The first powered, controlled flights by the Wright brothers in 1903.

(2) The cross-channel flight of Louis Bleriot in 1909, a dramatic demonstration of the ability of the airplane to cross international boundaries.

(3) The transatlantic flight of Commander Albert C. Reade in the U.S. Navy's NC-4 in 1919, which showed the potential of the airplane for inter-continental movement.

(4) The New York to Paris flight of Charles Lindbergh in 1927. A spectacular achievement by a man with great popular appeal, this flight fired the imagination of millions all over the world.

(5) The establishment and improvement of airports. Planes are no good without fields from which they can take off and on which they can land—or without adequate facilities for service.

(6) The development of aids to aerial navigation. This includes the laying out of well charted airways, the development of ILS, GCA, radar and other types of equipment for accurate, safe navigation.

(7) The jet engine, which emerged as a practical source of power just about the time the reciprocating engine-propeller combination was reaching its maximum development.

(8) Nuclear weapons. These increase the potential of military aviation many orders of magnitude, and will stimulate the constant, vigorous development of military aviation that will, in turn, inevitably and favorably affect commercial aviation.

(9) The piercing of the so-called sonic barrier, which opened the way to far greater speeds.

(10) The development of the jet transport for passenger use, which will permit great increases in man's ability to utilize his all-too-limited time and energy, for both work and recreation.

Where do we go from here? What do the projected curves show in the way of prospects and problems for the future? Of one thing we may be sure; science and technology will continue their inexorable advance. America must be in the forefront in new developments.

In the field of military aircraft, there are three new supersonic jet fighters already flying or on the way: the F-100, F-101, and the F-102. The F-100, now flying, is the first fighter to exceed the speed of sound in level flight. Earlier fighter planes have crossed the barrier, but only in dives.

The trend in the new interceptor fighter is toward more and more electronic equipment. With the F-102 we will achieve a plane in which the pilot will serve mainly as a monitor. He will handle the plane at take-off. Then a man on the ground will guide it, electronically, to the vicinity of

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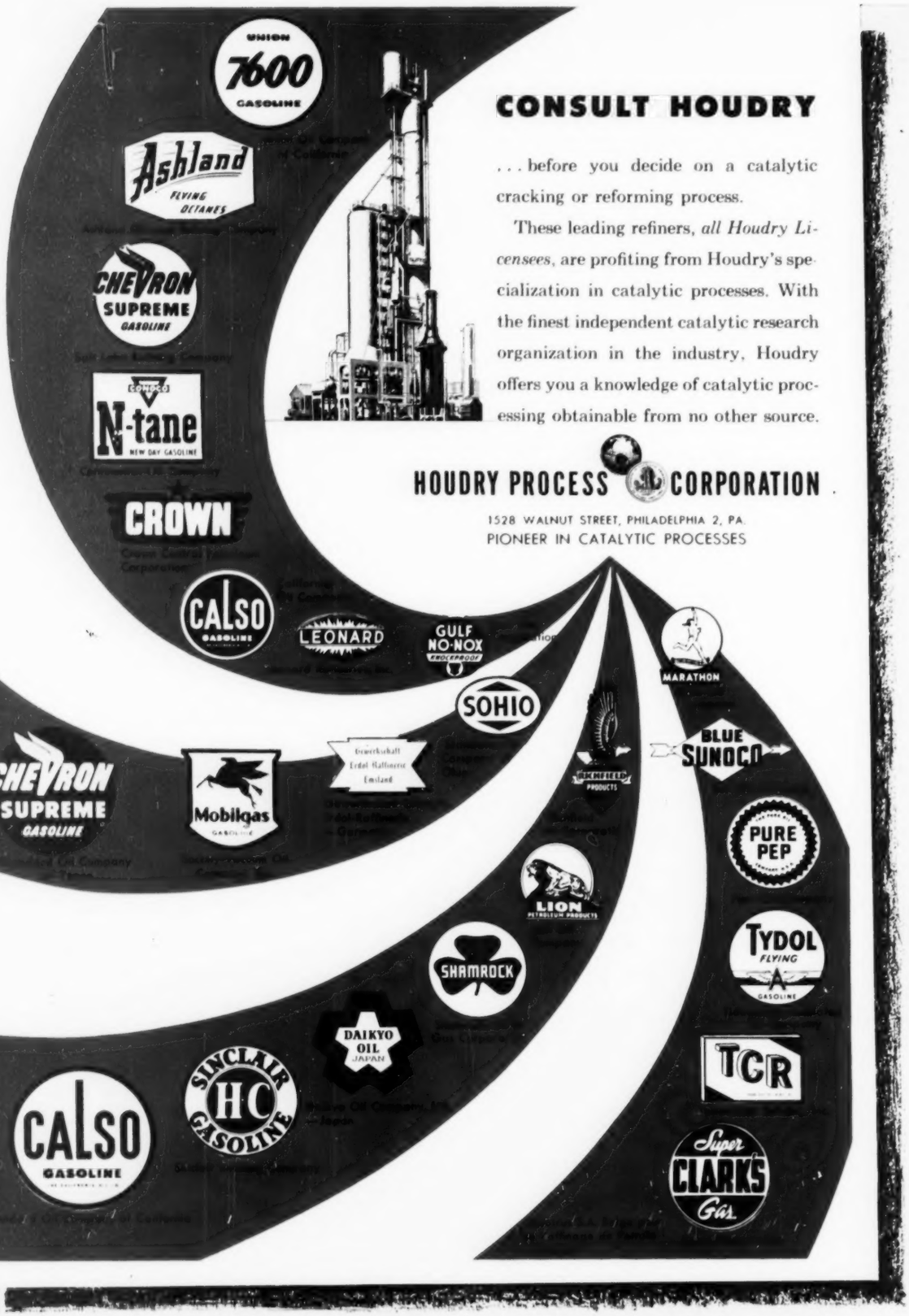

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the target. Here the pilot will turn a knob, switching control from the ground to the automatic instruments in the plane. These will track the target, get within proper range, aim and discharge the weapons. Then the pilot will turn the knob again to ground control and the plane will fly back to the base, where the pilot will take over and land it. It is obviously, from here, only a step to the pilotless, fully automatic, supersonic interceptor, winged or wingless.

As for bombers, the trend is also to jets. The present backbone of our strategic bombing units is the B-36, which has six conventional piston engines and four jets. It is being succeeded by the B-47, which has six jet engines, is smaller and is much faster. Another plane, now being produced but, because of the lead time involved, not yet available in the combat units, is the B-52, an eight-jet bomber. It is faster than the B-47, can fly higher and has more range. The next big step is to the supersonic bomber.

Beyond the piloted planes come the guided missiles. They will, for most military purposes, eventually largely replace military airplanes. Airplanes, however, are likely to be with us for some years to come.

An indication of the status of our missile development is given by the fact that we have obligated $2.5 billion for guided missile programs since the Korean war started. But at present little can be said about this work. There are four basic types of guided missiles: ground to air, air to air, air to ground, and ground to ground. In the field of intercontinental, ground to ground missiles, investigations are covering the speed range from subsonic through ballistic, that is, from speeds slower than that of sound to speeds many times as fast*.

There are difficult problems in the way of perfecting guided missiles, and the fate of civilization may depend on who solves them first.

Accurate guidance over long distances poses an extremely difficult problem. Their very high speeds have raised several interesting questions. One concerns the aerodynamic effects produced during the crossing of the sonic barrier, but these are now pretty well understood and are manageable. A second and apparently more difficult problem concerns the thermal barrier. A fast-moving plane generates heat as it moves through the air. This heat increases rapidly with increased speed. At twice the speed of sound, refrigeration is required to cool the pilot. At three times the speed of sound, undesirable changes occur in the strength qualities of aluminum. This problem may be solved, in its early stages, at least, by the use of stainless steel, titanium or other more heat-resistant materials. But the faster the missiles go, the more difficult the heat problem becomes. A ballistic missile traveling about 20 times the speed of sound would generate temperatures in the order of 15,000 degrees, Fahrenheit, far higher than any temperature ever achieved on earth except in an atom bomb. No known material can withstand such heat. A great deal of work remains to be done in developing adequate materials and temperature control, as well as in extending present range and accuracy. When conventional chemical fuels no longer meet requirements, a new energy source must be provided. Consideration is already being given to the development of equipment which will permit the use of atomic power in air weapons.

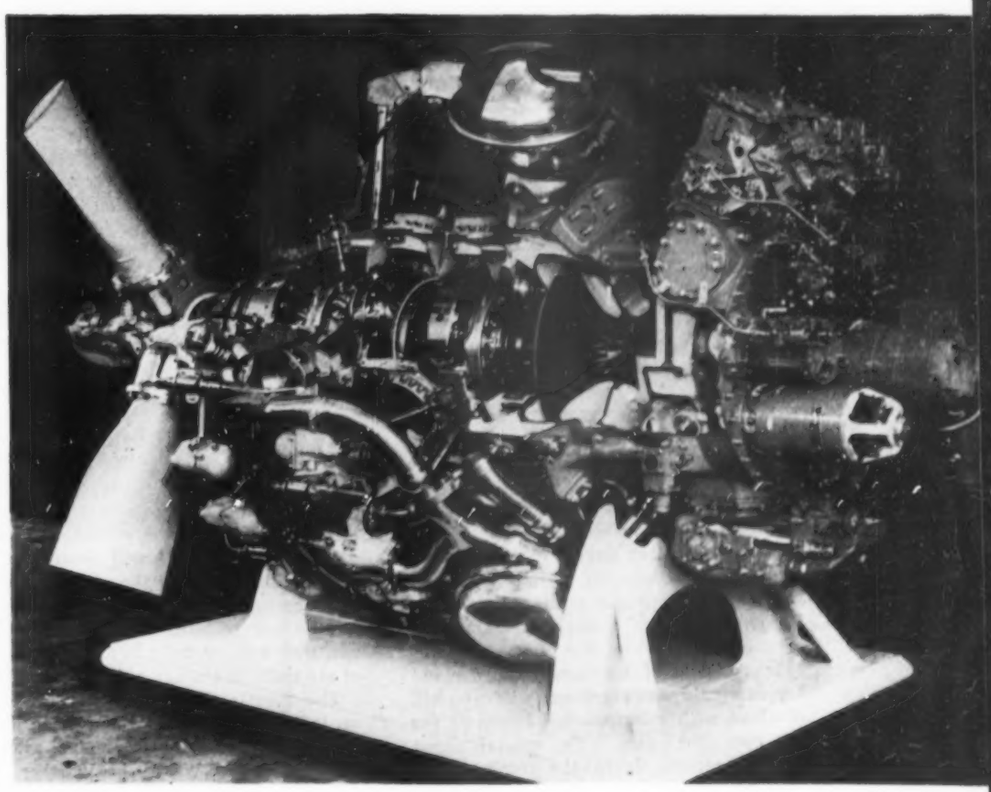
We must also work on the difficult problem of the interception of enemy subsonic, supersonic and hypersonic air weapons. Recent experience indicates that Russia is not far behind us in science and technology, and that it will require our very best efforts to remain ahead.

A third effect of very high speed has even more bizarre implications. The velocity of a guided missile must be kept under control. If it exceeds about 15,000 miles an hour, centrifugal force will begin to overbalance the pull of gravity and the missile will not come back to earth. Instead it will remain in space and probably become a satellite.

In piloted military aircraft, the most immediate questions revolve around the increasing complexity of our equipment. This is hard to control because, traditionally, the better the performance we seek, the more we want the plane to do, the more complex we must make the equipment. And our performance standards must be above the best any potential enemy can produce. We have already reached the point at which our air operations require faster and more accurate responses than human reactions and thought processes can provide. So we supplement the human factor with electronic and mechanical aids. This raises such important problems as increased cost, the ability of pilots to operate the equipment and of ground crews to maintain it.

To offset this, we strive constantly for greater simplicity, increased reliability, and size and weight reduction, as when we substitute the drop-size transitor for the vacuum tube. But we dare not seek simplicity at the expense of performance. Our first concern must be to get the best equipment for a given job at a given time, to make replacements only when we can do the job better or cheaper, and when the replacement will involve mini-

* Sound travels about 760 miles an hour at sea level, about 660 miles an hour at 40,000 feet and above. The fastest human flight so far has been about twice the speed of sound.



Cut-away view of new Wright Turbo Compound engine which will power the new Lockheed Super Constellation and the Douglas DC-7. Three blow-down turbines are integrated with the piston engine and geared to the crankshaft to add about 450 hp picked up from the piston engine exhaust. The engine has a take-off rating of 3,250 hp. The compound engine now appears to be the U. S. plane makers' idea of the commercial power plant for the immediate future.

mum interference with mass production schedules. Time is a critical factor in defense.

The prospects for civil aviation in America during the next 10 years can be summed up quite briefly. The last of the large piston engine transports now on order will be delivered in 1954 through 1957. These will be mainly DC-7's and super-Constellations. Additional future orders may be placed for these aircraft, but it is not expected that new piston engine models of large transport aircraft will be designed and produced. Although there are still many problems to be solved, it is a foregone conclusion that gas turbine powered transports will be in the future picture. They will probably carry from 85 to 100 passengers, fly over 500 miles an hour at up to 40,000 feet and have a range, varying with pay load, of up to 3,000 miles. Since they are expected to cost $4 or $5 million apiece, it is not likely that more than two or three American designs will be developed. A few may be in limited service by 1960, and wide use should occur by 1965.

The helicopter can also be expected to do a bigger job in civil aviation. It proved itself in Korea, where it evacuated 8,373 casualties and picked up 846 of our flying personnel from behind enemy lines. With the development of larger helicopters with multi-engine reliability and a capacity of as many as 50 passengers, we can expect to see them taking over much of the work on local service airlines, as well as the taxi operations between metropolitan centers and airports.

All these trends in aviation have definite implications for the oil industry. We are all naturally interested in the outlook for fuels and lubricants, both as to the size of the demand and the types of products that will be needed.

Projected military requirements give an indication of the future for aviation fuels. The military demand for aviation gasoline is expected to increase slightly for the next two or three years. Jet fuel demand, which is now considerably below that for gasoline, will rise fast with the delivery of increasing numbers of new jet planes, and by the end of 1954, the demand for jet fuel is expected to surpass that for gasoline. All this assumes there will not be an all-out emergency. In the event of a national emergency or another "police action" in the immediate future, the demand for gasoline would be much greater because of increased military flying, part of which would involve the large military airlifts that would still have to be conducted with piston engine aircraft.

Commercial aviation gasoline demand will increase gradually until the jet engine begins to replace the reciprocating engine.

In the field of lubricants, the demand for currently manufactured products will continue with about normal increases for the next few years. The special aspect of this picture is in the coming need for synthetics. The modern jet engine is already critical on conventional lubricants. We are rapidly approaching the time when petroleum products will no longer fill the jet engine lubrication bill.

The demand estimates given above must be qualified by the fact that they are based on today's generally backward thinking. If there is soon to be, as I sincerely hope there will be, a more realistic appreciation of our military air requirements and our commercial air potential, then the "road blocks" will be removed and the demand for all aviation petroleum products will be greatly increased.

As oil men we have the responsibility for developing the fuels and lubricants for the aircraft of the future. We have met similar responsibilities in the past. It is vital to national security that we maintain our record. It is essential that we, as an industry, preserve our strength and, particularly, our efficient and well-coordinated structures that make it possible for us to develop new products, and then manufacture and deliver them wherever and whenever they are neded, and in the required amounts. We can do this by maintaining a united front and protecting ourselves against those who, through selfishness or lack of foresight, would disintegrate the industry and thus seriously curtail its ability to meet both civil and military requirements.

I have saved for the last the one point that I consider most important for the future of aviation. It is also of great significance for oil men. It is the need for the continued development of better airport facilities throughout the United States. They, more than any other one factor, hold the key to the further growth of aviation.

And aviation is ready for more growth. The airlines are having the greatest year in their history. Passenger traffic continues to increase, and the newest phase of commercial aviation, air cargo, is expected to again double its volume before 1960. This phase in particular bears watching. The Air Force has made a survey of air cargo from the military point of view and found that it leads to spectacular savings, not only in time, but also in cost. Savings are represented by eliminating preparation for shipment and the great stock piles and the long, slow-moving supply lines involved in surface transport. The growth of a commercial air cargo industry will stimulate the civilian economy and provide a valuable reserve of equipment and experienced personnel that could be drawn on for defense.

But all this growth will depend on airport facilities, for all the movement must pass through them. If they can handle it easily, they will further the growth. If not, they will constrict it, and constriction of air traffic is already a present danger.

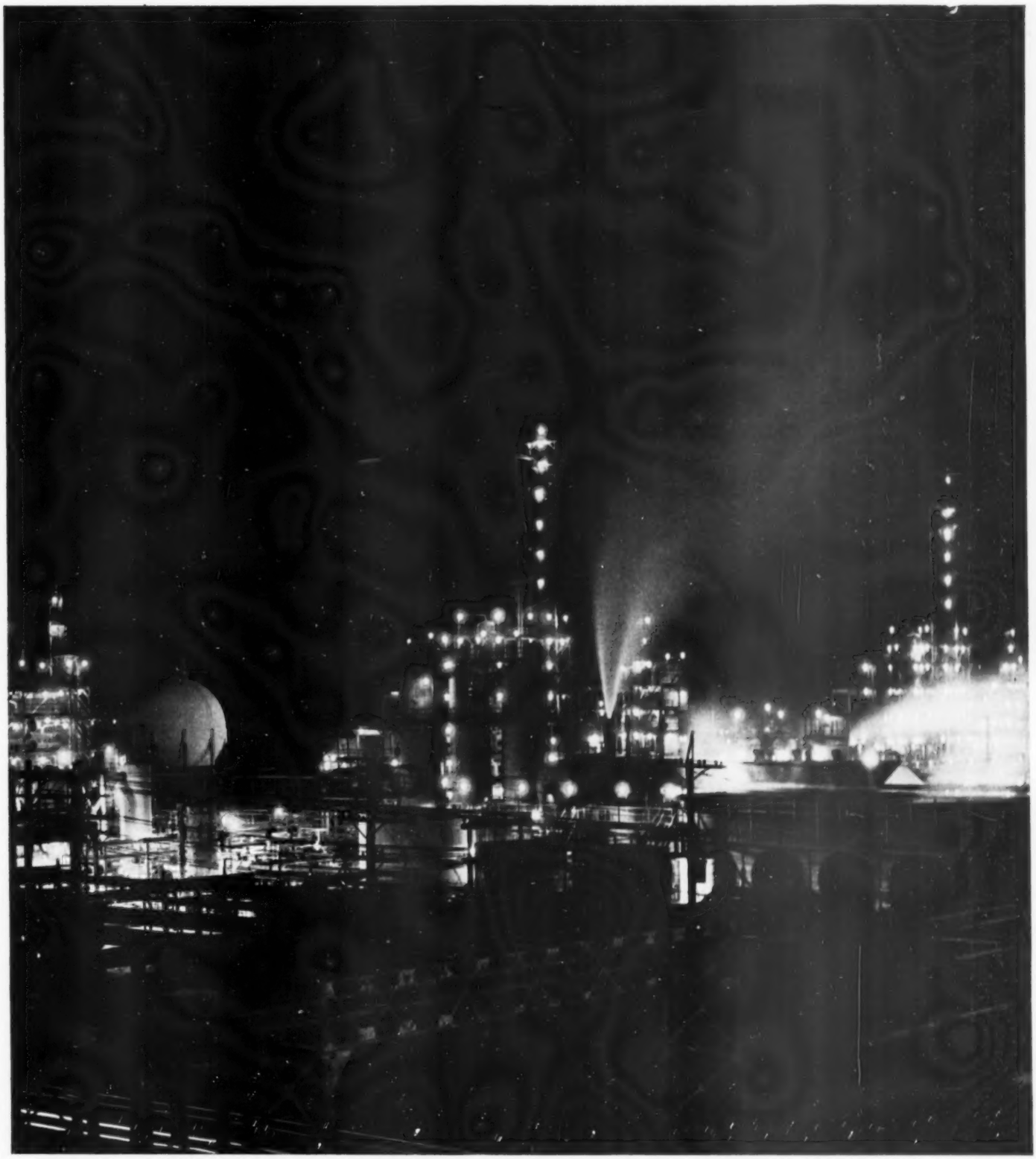
The fact is that our airports are not up to the job we want them to do. Some of our most important municipal airports are swamped. When the weather gets bad they have to cancel flights because their facilities are not equal to the traffic load under the more difficult conditions. There is serious need for improvement, for more facilities, better design and construction of runways for efficient and safe operation, cleared runway extensions, better air traffic control, better aids to navigation.

There is a clear parallel between our overloaded airports and our overcrowded highways. With the increase in the number of cars, trucks and busses, and the number of passenger miles driven each year, together with the migration of people from the rural areas to the centers of population, our roads and parking facilities, particularly in the metropolitan areas, have become less adequate, despite all our highway improvement programs. Movement becomes more difficult. The automobile becomes less useful. Unless we can expand our highway system fast enough to correct the imbalance, there may well be adverse effects on our entire economy. It will directly affect the automobile, steel and rubber industries and many others associated with the motor vehicle, including our own, and indirectly affect every industry and every individual.

The same is true of airports and aviation. Unless we can provide proper facilities for adequate growth, we face a danger of stagnation of communications, the effects of which will be felt far beyond the airline ticket office.

The urgency of improving both airports and highways was thrown into stark relief a few weeks ago by Val Peterson, the Civil Defense Administrator. Following the announcement that the Russians had exploded a hydrogen bomb, he released a statement indicating a "stepped-up civil defense program with an indicated policy change from shelter to orderly dispersal in the target areas." In plain talk, that means we'll depend on the Air Force's early warning network for up to a couple hours' warning, and when the red alert comes we won't go down the cellar; we'll get out of town. The cost of providing shelters against H bombs would run far into the billions and the program would be impracticable. However, if you have ever tried to get out of New York on a normal Friday afternoon, you can imagine what it would be like under the threat of attack.

Nations have seen the need for good channels of transportation before our time. The Caesars had their Roman roads. Hitler had his autobahns. These were for empire and conquest. Now we need more space for parking, carefully planned city egress networks, improved highways and better airports, at the very least in an emergency, for rapid dispersals and survival. At the best, if war does not come, and we hope it won't, we need them so our nation can benefit from the continuing growth of industry and commerce and live in security based on vision and strength.



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Hydrogen Processes in Petroleum Refining

Hydrogenation, Dehydrogenation, Hydrogenative Reforming and Hydrodesulfurization as Expressed in the U. S. Patent Literature and Reviewed by

Heinz Heinemann and Felix Heinemann

THIS REVIEW of United States patents deals with methods of changing the carbon to hydrogen ratio of petroleum hydrocarbons in processing operations designed to upgrade petroleum fractions. Hydrogenation and dehydrogenation reactions have long been recognized as an essential part of our petroleum technology and the patent literature includes many thousands of patents in these fields. It is obviously impossible to cover the entire development within the scope of a review article, and an effort has therefore been made in the present case to discuss recent patent developments, covering approximately a two-year period, in the light of a very brief survey of older developments pertaining to the specific subjects under discussion. Even within this limited objective, it has not been possible to enumerate all of the newer patents and a selection had to be made which the authors hope is representative, although they recognize that it is arbitrary. The very large field of hydrocarbon synthesis, hydrogenation of carbon oxides and oxo synthesis has been omitted from this review because they appeared outside of its immediate scope. The authors have in this article considered patents issued until September 15, 1953.

Hydrogen from Hydrocarbons

Hydrogen production from hydrocarbons is an old process. It is based primarily on the methane-steam reaction, a dehydrogenation reaction: $CH_4 + H_2O \rightarrow CO + 3H_2 + 51$ Kcal. The mixture of carbon monoxide and hydrogen is desirable as feed for hydrocarbon synthesis processes. Where hydrogen is the objective, the reaction is carried out in two stages with the water gas shift reaction: $CO + H_2O \rightarrow CO_2 + H_2$ following the methane-steam reaction. Nickel, promoted by magnesia or alumina on an inert support, is normally used as a catalyst at 800-1,000° C. A new source of industrial hydrogen from hydrocarbons has been developed with the rapid growth of hydrogenative reforming, which involves naphthene aromatization and production of three moles of hydrogen per mole of aromatic formed. (See section on reforming.)

A number of additional methods of producing hydrogen from hydrocarbons has, however, been disclosed in the more recent patent literature. J. H. Shayleigh (2,639,223 to Hercules Powder Co.) passes normally gaseous hydrocarbons in a 1:2 volume ratio with steam at 700-800° C. over a catalyst comprised of 10-50 percent nickel, 10-30 percent magnesia and 20-80 percent zirconium silicate. Space rates of about 500 vol. of gas/vol. of catalyst/hour are used, and with propane, conversions of 90-97 percent are obtained. W. G. Scharman (2,565,395 to Standard Oil Dev. Co.) passes an olefin-containing hydrocarbon feed together with a mild oxidizing gas over a plurality of beds of a metal catalyst comprising metals of group VIII of the periodic table. Conditions are selected to increase conversion of saturated hydrocarbons and cracking of unsaturated hydrocarbons in the direction of flow. Olefins in the feed are completely converted into hydrogen and carbon oxides at 900-1,600° F. over the first catalyst bed.

A Phillips Petroleum Company patent (2,647,041, S. P. Robinson) describes contacting of hydrocarbon gas with pebbles consisting of at least one metal of the iron, chromium, nickel, and copper group at sufficient temperature (1,300-2,000° F.) to cause decomposition to hydrogen and carbon. The pebbles are then transferred to a heating zone where they are treated with water-gas and hot blue gas devoid of free oxygen at 1,500-2,400° F. to remove carbon and form more hydrogen. Coking of hydrocarbons with fluidized particles of higher oxides of iron at 700-1,200° F. is the subject of Union Oil Company of California's patent 2,635,947 (H. C. Reed and C. H. O. Berg). The coke-laden iron oxide particles are separated and treated in the fluidized state at 1,000-1,500° F. with oxygen-containing gas, forming carbon oxides and lower iron oxides, which in turn are treated at 800-1,500° F. with steam to produce hydrogen and restitute the higher oxides of iron. A different approach to coking is taken by G. A. Mills (2,647,042 to Houdry Process Corp.) who thermally treats spent cracking catalysts containing nonvolatile hydrocarbonaceous material at 1,200-1,800° F. in the presence of an inert flush gas, such as helium, and in a nonoxidizing atmosphere. Decomposition occurs with evolution of a gas comprised predominantly of hydrogen.

Hydrogenative Reforming of Naphthas

Hydrogenative reforming has been an active development for the past 15-20 years. All hydrogenative naphtha reforming processes are based on five basic reactions: (1) dehydrogenation of cyclohexanes to aromatics; (2) dehydroisomerization of methylcyclopentanes to aromatics; (3) dehydroaromatization of paraffins; (4) hydrocracking of paraffins; (5) isomerization of paraffins. The first three of these reactions produce hydrogen, usually in amounts much larger than are consumed in reaction (4). Yet hydrogenative reforming is carried out under large hydrogen partial pressure in order to maintain catalyst activity and reduce coke lay-down. Since hydrogenative reforming is predominantly an aromatization process, it is suitable both for the production of aromatic chemicals and of high octane gasoline from petroleum naphthas.

The oldest hydrogenative reforming process is "Hydroforming," a fixed bed process employing a molybdena-alumina catalyst. The process was developed in this country by the Kellogg Company, the Standard Oil Company of New Jersey and the Standard Oil Company of Indiana and was simultaneously developed in Germany. A very large number of patents has been issued between 1935 to 1950 to cover features of this process and of catalyst manufacture. Original catalysts prepared by impregnation of alumina with molybdenum compounds, drying and calcining were found irferior to so-called "coprecipitated" catalysts which have better stability and lower coke-forming tendencies. Dehydrogenation of cyclohexane type naphthenes plus hydrocracking of paraffins are the main reactions proceeding. Dehydroisomerization and dehydroaromatization occur to a lesser extent. Hydroforming is a regenerative process with on-stream cycles of 6-200 hours, depending on operating conditions. Operation is at 950-1,050° F. and 200-400 psi pressure. Space

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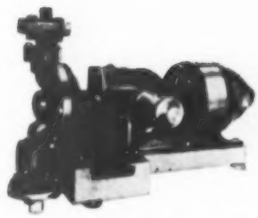

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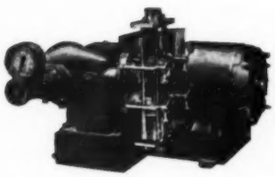

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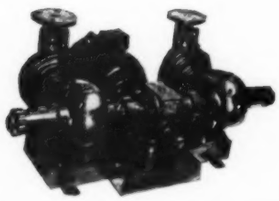
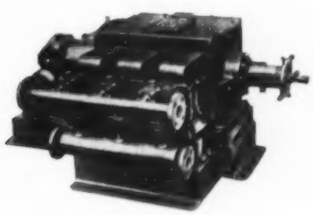
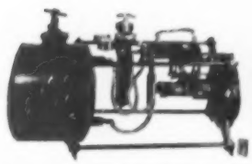


Twin G/250 diaphragm pumps. Can be supplied in multiple units of eight or ten pumps.



Treble plunger pump with micro-variable volume control. High volumetric efficiency straight-line ram [illegible]



Pneumatic chemical feeder driven by natural gas or compressed air

rates of 0.5-2 V V/hr. and hydrogen recycle ratios of 3,000-4,000 cu. ft./bbl. of naphtha are employed. The reaction is very endothermic, requiring reheating of the feed between reactors. Coke formation is as high as 2 percent of the feed stock. A recent patent of Standard Oil Development Company (2,638,454 R. Bowan, Jr.) describes preparation of a hydroforming catalyst, prepared by impregnating low sodium content aluminum trihydrate with molybdena and an iron group metal in an amount to form about 5-25 wt. percent molybdate in the finished catalyst. The mass is heated for 4-8 hours at 1,100-1,200° F. and plastic clay is added in an amount to give 5-25 percent of finished catalyst. The mass is finally calcined for 4-8 hours at 1,100-1,200° F.

A method of upgrading motor fuel is disclosed by E. C. Corner and F. B. Fischl (2,651,597 to Standard Oil Development Company). Naphtha is separated into fractions of different hydrocarbon type, and the fractions are subjected to separate isomerization and aromatization steps. Selected combined fractions are then hydroformed.

During the last few years "fluid hydroforming" has been developed, involving a constantly cycling catalyst stream, passing from reaction to regeneration zone and back. Higher catalyst-to-oil ratios are thus made possible. No patents have yet been issued on this new version of hydroforming.

The use of chromia-alumina catalysts rather than molybdena-alumina has also been proposed for many years. The new T.C.R. reforming process employing developments of both Socony-Vacuum Oil Company and Standard Oil Company of Ohio employs a chromia-alumina bead catalyst in a moving bed operation at somewhat lower temperatures and pressures than those used in hydroforming. W. H. Lang and C. L. Gutzeit (2,645,605 to Socony-Vacuum Oil Co.) describe the reforming of a petroleum naphtha at 975-1,025° F., 400-600 psi pressure, a space rate of 2 V/V/hr. and a 3-6 hydrogen/oil mole ratio over a catalyst consisting of an alumina base containing 10-35 percent chromia, 0.2-1.5 percent fluorine and an amphoteric metal consisting of tin, antimony or bismuth in amounts varying from 0.5-0.75 times the amount calculated to form the normal fluoride of the amphoteric metal in its lower valence form. R. L. Smith, in another Socony-Vacuum Oil Company patent (2,635,082), discusses preparation of a chromia-alumina gel (10-40 percent Cr_2O_3) by admixing chromium acetate and alkali metal aluminate to produce a hydrosol. This is permitted to set and the gel is aged in a mildly alkaline aqueous medium at pH 8-9.5, washed, dried and calcined. After aging, the gel is contacted with an aqueous alkaline solution of a pH above 10 for a sufficient period of time to dissolve at least a portion of the surface alumina.

A two-stage hydroforming process employing chromia-alumina catalyst in the first and molybdena-alumina catalyst in the second stage is disclosed by A. Clark (2,645,604 to Phillips Petroleum Co.). A pressure of 200-500 psi is maintained in both zones, while the temperature is 950-1,050° F. in the first and 850-930° F. in the second. No reheating is necessary between zones. The ratio of the two catalysts depends on the feed composition. The more normally paraffinic the feed, the more molybdena catalyst is employed.

E. J. Houdry (2,578,704 to Houdry Process Corp.) discusses a processing method employing dehydrogenation catalysts. Liquid hydrocarbons boiling in the range of gasoline and naphthas are contacted in vapor phase under dehydrogenating conditions at elevated pressure with a coke-containing catalyst in the presence of added hydrogen-rich gas. The coked catalyst will have a higher temperature than the hydrocarbons to raise the temperature of the latter to and within dehydrogenation temperature range. The thus partially dehydrogenated hydrocarbons are then contacted with freshly regenerated dehydrogenation catalyst of higher temperature than the coke-containing catalyst. A normally liquid hydrocarbon fraction of higher octane rating than the charge material is separated.

Hydrogenative naphtha reforming processes over fixed bed catalysts employing a precious metal such as platinum as a dehydrogenating component have been announced and are being commercialized by Universal Oil Products Company, Atlantic Refining Company, Houdry Process Corporation, Sinclair Refining Company and Standard Oil Company of Indiana. All these processes are characterized by long on-stream periods and infrequent, if any, regeneration, very efficient dehydrogenation and isomerization. They operate at 250-700 psi, 850-950° F. with hydrogen recycles of about 10 moles per mole of feed. Better aromatization is obtained at lower pressures, but more frequent regeneration is also necessary with low pressure operation. The processes can be used both for naphtha reforming to gasoline and for the production of benzene, toluene and xylenes. While results obtained with all but the last named of the above processes have been published in the literature, they are new enough that patents have so far been issued only to the first two companies, with many other applications probably being processed in the U. S. Patent Office.

A patent to Atlantic Refining Company (2,550,531, F. G. Ciapetta) describes a catalyst comprising a cracking component such as silica-alumina and 0.01 to 2.5 wt. percent of a metal of the group consisting of platinum and palladium. The silica-alumina support has a surface area of 10-65 m^2/g. and is obtained by steam deactivation of a cracking catalyst. Reforming in the presence of hydrogen is carried out at 825-950° F. and 300-700 psi pressure.

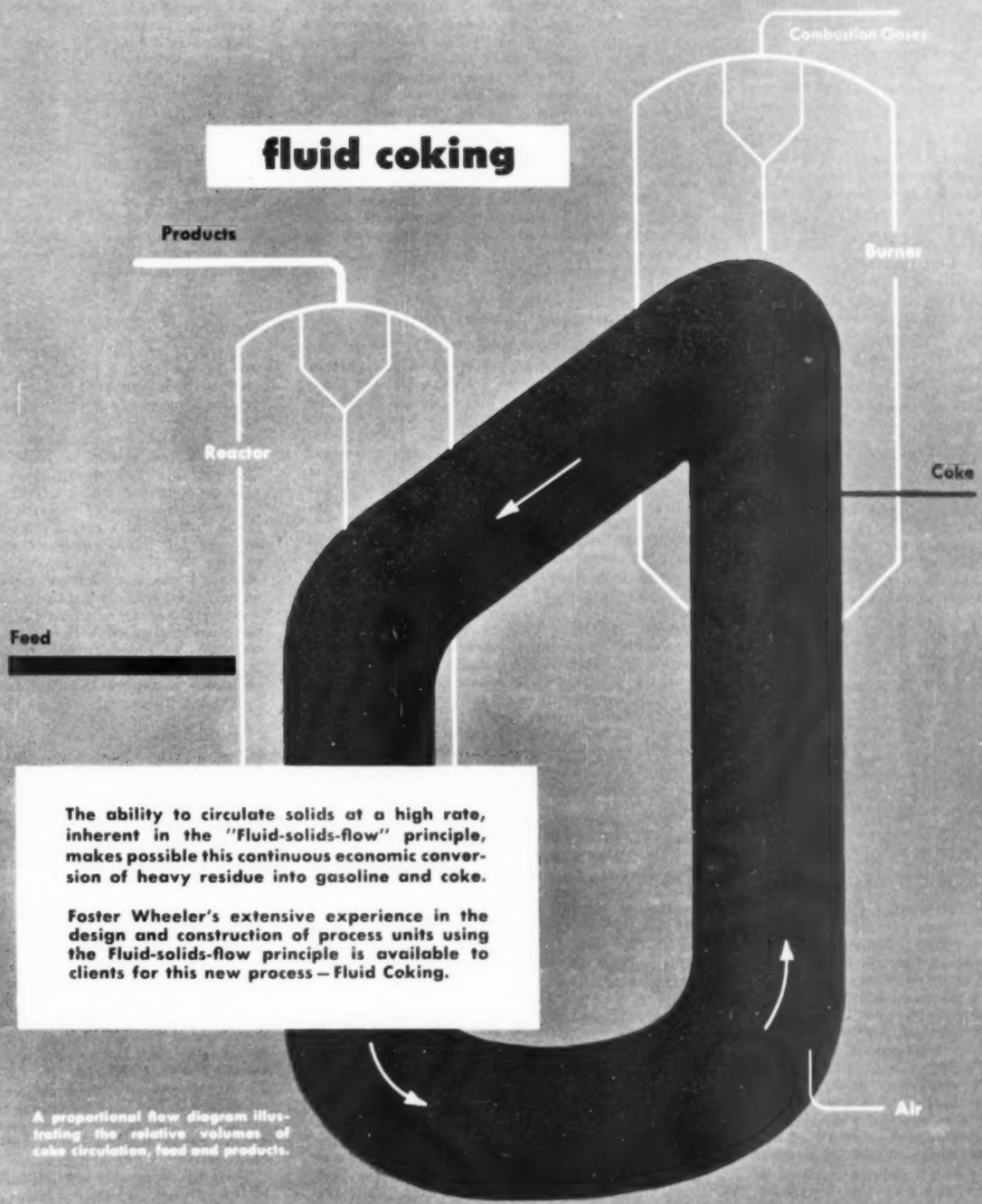
Deactivation of the silica-alumina cracking component prior to impregnation with platinum may also be effected by base exchanging it with an alkali metal, incorporating 0.5-4 percent alkali into the catalyst. (2,651,598 F. G. Ciapetta to Atlantic Refining Co.)

A rather large number of patents has been issued to Universal Oil Products Company in the course of the last three years. Haensel and Gerald claim the reforming of a gasoline fraction with a catalyst consisting of a cracking component comprising silica and at least one oxide of aluminum, zirconium, magnesium or thorium and hydrogenating component comprising platinum or palladium metal in an amount of 0.2-2 g. per 100 cc. of final catalyst. (2,478,916). In U.S. Patent 2,479,109, Haensel claims a hydrogenation reforming catalyst produced by combining alumina with 0.1-8 percent by weight of a halogen, admixing a platinum-containing solution with this combination, and calcining the material obtained. Operation with this catalyst is described in patent 2,479,110. Variation of the catalyst preparation technique is the subject of numerous patents of Haensel and coworkers. Some of the features of these patents are: introduction of platinum as a colloidal sulfide (2,566,521; 2,611,749); dissolving of platinum in nitric or sulfuric acid and compositing the solution with alumina prior to calcination and incorporation of halogen (2,636,863); impregnation of alumina with a platinum compound in contact with a basic ammonium salt or an organic amino compound (2,623,860); control of the pH of the impregnating solution at above 5 (2,623,861; 2,631,136); controlled washing of alumina gel from $AlCl_3$ to retain 0.1-8 percent chlorine (2,582,428); inclusion of not more than 1 wt. percent of an oxide of an alkaline earth metal or magnesium in the catalyst (2,602,772); inclusion of small amounts of boron oxide in the alumina-halide-platinum catalyst (2,625,504); calcination of alumina before and after impregnation with platinum and halide (2,606,878); forming and shaping of alumina-halide mixtures prior to calcination and impregnation with platinum (2,611,736). Regeneration of a platinum-alumina-halogen catalyst which has become deactivated by coke lay-down can, according to Haensel (2,641,582) be carried out by first treating the catalyst with air at 500-700° F. for 6-30 hours and subsequently at 800-1,000° F. for 1-6 hours. Platinum modification at high local temperatures is avoided.

Another series of Universal Oil Products Company patents deals with modifications of the processing steps. A three-stage process employing platinum catalyst is discussed by L. S. Kassel (2,573,147) Hydrocarbon feed is passed over the first catalyst body at low temperature and high space rate to remove deleterious, carbon forming constituents without substantial

(Please turn to page 116)

fluid coking



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Hydrogen Processes in Petroleum Refining

(Continued from page 114)

reforming. In the second catalyst body, which is radiantly heated, endothermic aromatization occurs. Hydrocracking under adiabatic conditions takes place in the third stage. H. W. Grote (2,596,145) employs two stages and charges an olefin-free, naphthene-rich naphtha to the first zone, in which dehydrogenation is the dominant reaction. The effluent is then blended with a paraffinic, olefin-free and naphthene-lean naphtha in an amount to lower the aromatics content of the mixture below 25 percent and this mixture is then subjected to hydrocracking over the platinum-alumina-halogen catalyst. Patents to Berger, Haensel and Cox (2,642,383; 2,642,384; 2,642,385) deal with control of the hydrocracking function of platinum-alumina-halogen catalysts. When it is necessary to increase operating temperature, an undesirable increase of cracking activity can be avoided by adding small amounts of water to the feed, which will hydrolyze the halide. If, on the other hand, an increase in cracking function is desired, small amounts of a halogen compound reactable with alumina are added to the feed. A process for contacting a straight run gasoline fraction with an olefinic hydrocarbon in the presence of a platinum-alumina catalyst at 750-1,000° F. and above 100 psi pressure is claimed by C. V. Berger (2,630,404).

A few patents have recently been issued which involve hydrogenative reforming with different catalyst types. U.S.P. 2,635,123 (R. M. Kennedy to Sun Oil Co.) describes the reforming of a motor naphtha containing at least 5 percent naphthenes with a catalyst comprising 75-99 percent silica, 0.5-15 percent alumina and 0.2-10 percent nickel. Chromia may be substituted for the alumina and cobalt for the nickel. The reaction, consisting primarily of naphthene dehydrogenation and paraffin isomerization, is carried out at 600-1,200° F. and 50-1,500 psi pressure. M. H. Gwynn (2,587,149) discusses regeneration of metal catalysts such as nickel used in the hydroforming of sulfur-rich stocks. Nickel sulfide is oxidized to sulfate and the latter is treated with an aqueous solution of a highly alkaline compound of sodium, e.g. sodium carbonate. The nickel is precipitated as a readily reducible oxygenated compound which can be returned to the hydroforming process.

Hydrogenation and Dehydrogenation

Catalytic hydrogenation or dehydrogenation of hydrocarbons has long been carried out, for instance, to obtain valuable chemicals such as butadiene from butane or butenes or saturated compounds from olefins or diolefins. Production of aromatics from naphthenes has been largely covered in the section on reforming.

A dehydrogenation catalyst for paraffin conversion is described in Universal Oil Products Company patent 2,592,765 (C. L. Thomas and J. C. Morrell). It comprises 50-90 percent alumina, 5-30 percent kaolin or montmorillonite clay and 4-20 percent of an oxide of a metal of the left-hand columns of groups V and VI of the periodic table. E. W. Pitzer (2,586,377 to Phillips Petroleum Co.) discloses dehydrogenation of C_3 to C_{10} hydrocarbons with a synthetic gel catalyst containing alumina, beryllia and an oxide of vanadium, chromium, molybdenum or tungsten at a temperature of 900-1,300° F. and a pressure up to 500 psi. In another Phillips Petroleum Company patent (2,576,034), J. W. Myers dilutes paraffin hydrocarbons with 1-30 vols. of steam and then contacts them with a catalyst consisting of 10-45 wt. percent alumina and 90-55 percent of at least one of the oxides of molybdenum, tungsten or vanadium to effect dehydrogenation.

Two patents to E. I. du Pont de Nemours and Company (2,584,531 and 2,642,463: H. R. Arnold and J. E. Carnahan) deal with hydrogenation of olefins, e.g., cyclohexene to cyclohexane. The hydrocarbon is contacted in one case at 70-450° C. with hydrogen and a molybdite of a metal, such as nickel, whose ions are soluble in aqueous ammonia in an amount greater than that stoichiometrically required to precipitate the metal ion. The acid of the molybdites may have the formulas H_2MoO_3 or H_2MoO_4. In the other case, the catalyst is a metal tungstide, which is the metal salt of an acid H_2WO_3 or H_2WO_4. The metal may be nickel, cobalt, iron, copper, zinc, silver, cadmium, manganese or tin. Hydrogenation of an olefin to the corresponding paraffin can be carried out over silica-alumina at 325-400° C. in the presence of a hydrogen donor-like cis-decalin, according to C. J. Engle (2,564,964 to Phillips Petroleum Co.). Ipatieff and Pines (2,586,353 to Universal Oil Products Co.) hydrogenate aromatics in a nickel-containing stainless steel vessel over copper and alumina at 200-400° C. and at 50-200 atm. Standard Oil Development Company patent 2,638,438 (E. J. Hoffmann and E. F. Wadley) deals with the selective hydrogenation of diolefins in naphthas. A caustic soluble organic sulfur compound is added in amounts of 0.1-1 wt. percent to the naphtha, which is then hydrogenated with sulfur resistant catalysts at about 500° and 45 psi. The product is thereafter caustic washed to remove the sulfur compound.

Hydrogenation of Residua

Hydrogenative upgrading of heavy oils and residua was developed in Germany and further developed in this country by Standard Oil Company of New Jersey. There are innumerable patents issued to Matthias Pier and his co-workers and to The Standard Oil group on this subject. The process involves two to three stages. In the first or slurry stage, the residuum is hydrogenated in liquid phase at 3,000-10,000 psi and 750-900° F. with catalysts, such as tin compounds, suspended in the liquid feed. The product is distilled, the heavy ends being recycled to the first stage. Middle oil boiling up to about 700° F. may be presaturated at high pressure and temperatures of 700-850° F. over tungsten sulfide catalysts to reduce sulfur and nitrogen content. In the third, or vapor phase stage, the middle oil is hydrocracked over sulfur resistant hydrogenation catalysts such as molybdenum sulfide or tungsten sulfide supported on a cracking component (e.g., activated clay) in the presence of hydrogen and at 750-950° F. and 3,000 to 10,000 psi. Large volumes (better than 100 vol. percent on feed) of low octane number gasoline are obtained. Most patents deal with one of the process stages or the catalysts employed therein.

Two patents assigned to Gulf Research and Development Company (2,585,337 and 2,602,773, J. B. McKinley and W. C. Starnes) are concerned with catalysts for the vapor phase step destructive hydrogenation. A silica-alumina cracking catalyst is composited with 0.5-4 percent of molybdenum trioxide by impregnation with aqueous $MoCl_5$ solution, drying and calcining. After periodic regeneration following use, the catalyst is treated with H_2S to convert the oxidized hydrogenating component to sulfide. The partial pressure of water vapor formed is maintained below 30 psi. In another Gulf Research and Development Company patent (2,640,009), C. W. Montgomery and C. S. Brown discuss a destructive hydrogenation catalyst which gives less coke deposit and has a lower hydrogen requirement than usual. It is prepared by treating a hydrogenating catalyst (16-22 percent Ni) on a solid refractory cracking catalyst (SiO_2-Al_2O_3) with wet steam at 350-550° F. and 135-1,000 psi for ½-2 hours. I. W. Mills and H. L. Johnson (2,635,081 to Sun Oil Co.) prepare a vapor phase catalyst by impregnation of 10-25 percent molybdenum sulfide on a silica-alumina cracking catalyst which has been spent in catalytic cracking to at least 30 percent loss of its initial activity after regeneration.

In Sun Oil Company patent 2,649,419 (H. L. Johnson and A. P. Stuart), a vapor phase catalyst composition is given as 10-25 percent MoS_2, 9-30 percent iron (as Fe_2O_3), 4-9 percent silica, 1-4 percent titania and 40-75 percent alumina.

Hydrogenolysis of heavy oils is the subject of a number of Phillips Petroleum Company patents. R. W. Blue and C. J. Engle (2,620,293) employ a naphthene hydrocarbon as hydrogen donor for the conversion reaction and use a plurality of catalysts, some of which work as olefin-forming catalysts, while others are hydrogen transfer catalysts. In patent 2,619,450 (H. W. Flemming), heavy hydrocarbon material is catalytically hydrogenated at 800° to 900° F. with not more than 400 cu. ft./bbl. of hydrogen to produce gas, gasoline and gas oil. In another patent (2,627,495), W. C. Lanning subjects a heavy residuum containing both paraffins and aromatics to extraction to selectively dissolve aromatics. The raffinate is subjected to high pressure hydrogenolysis. The aromatic extract is freed from solvent and hydrogenated at different operating conditions. Gasoline of good quality is recovered from the latter treatment, while gasoline recovered from treatment of the raffinate is recycled as solvent to the extracting operation.

Hydrodealkylation of fractions rich in alkylated naphthalenes is accomplished according to 2,653,176 (L. H. Beckberger to Sinclair Refining Company) by passing the fraction together with hydrogen-rich gas and steam at 1,200-1,800° F. to a catalyst comprising a major amount of iron oxide with promoting amounts of chromia and an inorganic oxygen-containing compound of sodium or potassium.

Hydrodesulfurization

Removal of sulfur compounds from gasoline and higher boiling hydrocarbons by hydrogenation to hydrogen sulfide has been developed in several processes. The German destructive hydrogenation process employs a "presaturation" step in which hydrodesulfurization is achieved over tungsten sulfide at 700-850° F. and 3,000-10,000 psi. Hydrodesulfurization is incidental also to the other stages of this or other hydrogenolysis processes. Union Oil Company of California introduced a cobalt molybdate on alumina catalyst for hydrodesulphurization of naphthas at 650-750° F. and pressures of 100-250 psi. Many of the more recent processes on which patents are currently issuing employ this catalyst.

Numerous patents to Anglo-Iranian Oil Company are concerned with the "Autofining" process which hydrodesulfurizes gasoline while simultaneously causing enough naphthene dehydrogenation to supply the hydrogen requirements of the desulfurization, so that the process is balanced in hydrogen production and requirement. The basic process is described for various hydrocarbon fractions in patents 2,573,726; 2,574,445; 2,574,446; 2,574,447; 2,574,448; (F. W. B. Porter, F. R. Green and P. Docksey). Autofining as a feed preparation for catalytic cracking is disclosed in 2,574,449 (H. T. Lorne and F. W. B. Porter). The process is extended to aromatic extracts containing sulfur and naphthenes (2,574,450, F. W. B. Porter and R. P. Northcott); to mixtures of catalytically cracked naphtha, kerosene and straight run gasoline (2,574,451, Porter and R. Purdy); and to petroleum fractions boiling at least in the range of wax distillates (2,604,436, S. W. Adey and F. W. B. Porter). Processing schemes are given in 2,606,141 (P. Myer) and 2,640,802 and 2,648,623 (F. W. Porter and R. P. Northcott) in which cracked naphthas are hydrodesulfurized without change in boiling range by passing the sulfur compound and naphthene containing feed at 780-800° F., 0.5-1 V/V/hr. and 25-75 psi pressure over the cobalt molybdena alumina catalyst and adjusting the temperature to provide enough dehydrogenation to satisfy the hydrogen demand but avoiding excess dehydrogenation. Hydrogen-rich gas is recycled.

Shell Oil Company has announced a desulfurization process which operates at 600-700° F., 700-800 psig, liquid hourly space rates of about 10 V/V/hr. and a hydrogen-to-hydrocarbon ratio of 7 moles. Tungsten-nickel sulfide or cobalt-molybdenum alumina catalysts are employed. A recent patent to Shell Development Company (2,591,525, W. F. Engle and P. van't Spijker) describes how for resulfurizing a hydrocarbon oil boiling above the gasoline range, a lower-boiling non-paraffinic hydrocarbon oil is added in an amount sufficient to reduce the critical temperature of the resulting mixture to at least 20° C. below the operating temperature. The mixture is then contacted with a sulfactive hydrogenation catalyst, such as a molybdenum oxide-cobalt oxide-alumina catalyst at a temperature at least 20° C. above the said critical temperature and between 325-450° C. while compressed to a density of at least 0.25 g./cc. The lower boiling oil is then separated from the desulfurized oil.

Gulf Oil Corporation and Gulf Research and

(Please turn to page 156)

The Jungle and the Jet

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Government Oil Monopoly Confirmed in Brazil

By R. G. Walker

PRESIDENT VARGAS sanctioned the Petrobras Law on October 3 in the form in which it was approved by the Chamber of Deputies in the final meeting at the end of September. The long drawn-out preliminary skirmishes around the Brazilian oil question have thus ended in a complete victory for the advocates of a state monopoly, despite the vehement protests of many eminent Brazilians against such a policy.

The struggle began in 1938, when the first petroleum statute nationalized the oil industry. Ten years later, in 1948, an attempt was made to revise the earlier law and bring it into line with the more liberal Constitution of 1946. The so-called "Dutra Bill," drawn up by a committee of experts, classed oil deposits as inalienable state properties and retained the maximum share in exploitation for the Union. Concessions for inland and coastwise traffic, as well as for refining for domestic consumption, could only be granted to mixed-economy societies, or to companies in which 60 percent of the voting shares was held by Brazilians. Refining and transporting for the foreign market, however, could be delegated to firms organized and controlled from abroad.

The last-named clause aroused strong opposition and, after a few spasmodic debates in the Chamber during the next two years, the bill, by tacit consent, was allowed to sink into oblivion.

President Dutra then went ahead with development without waiting for new legislation. Projects for state and private refineries were approved, but only Brazilians were allowed to hold shares in the latter. The government acquired a fleet of tankers and built a pipe line from the port of Santos to Sao Paulo, while the National Petroleum Council engaged experts abroad in order to speed up prospecting and drilling.

These measures provided no real solution to Brazil's oil problem. Consumption of petroleum products was doubling every six years, absorbing exchange reserves, and unsettled world conditions threatened supplies from abroad. In December 1951 President Vargas submitted a new project to the Chamber of Deputies, providing for the creation of a stock company, Petroleo Brasileiro S.A. (Petrobras), to control all oil activities. In accordance with Article 17, Petrobras would operate directly or through enterprises it might organize or associate itself with, with the approval of the National Petroleum Council. No restriction was made regarding the formation of subsidiaries, or the activities in which they might engage, except that the Union must always retain the majority of the voting shares and that the number of directors to be nominated by private shareholders was limited.

The bill was debated for twelve months in the Chamber, where the members were divided into three groups: the advocates of an absolute state monopoly; those who favored granting concessions to national and foreign firms under adequate state control; and those who voted for a mixed-economy arrangement, in which state participation should predominate. The first-named group prevailed and the revised bill, creating a state monopoly, was forwarded to the Senate at the end of 1952.

In the upper house the consensus which seemed at first to favor a larger participation of private enterprise, veered later toward a somewhat attenuated form of state monopoly. A number of minor alterations to the bill were approved without difficulty, but the debates mainly centered around two alternative amendments, namely: the nationalist formula, authorizing Petrobras to contract with specialized private firms, national or foreign, for prospecting and drilling; and a more liberal alternative, which permitted private firms to participate under direct concession in industrial exploitation, as well as in prospecting and drilling.

A compromise was eventually reached between the opposing groups and the following clause was approved: "After consultation with the National Petroleum Council, the government may contract, through the intermediary of Petrobras, for prospecting, drilling and extracting with specialized companies of recognized technical and financial capacity, for payment in monies or in kind, including the guarantee of participation in the products of this development, so as to ensure compensation for the risks incurred."

This somewhat half-hearted attempt to weaken the monopoly was rejected by the Chamber of Deputies when the bill returned there for final reading in June of this year. A few minor amendments, introduced by the Senate, were allowed to stand, but in substance the bill, as it finally passed the Chamber at the end of September, is the same as that which was approved in November 1952.

The Brazilian press seems to have accepted the state monopoly as an accomplished fact, outside the orbit of discussion. Even those who were loudest in opposition have refrained from comment, except to express doubts as to whether Brazil's financial situation justifies the heavy expenditure involved, at a time when urgent public works are being restricted in order to effect economies. It seems clear, however, that present opinion is definitely in favor of a strong nationalist policy in the economic field and that this policy will be carried out despite the limited reserves of capital available in Brazil for development.

FINAL DRAFT OF THE LAW CREATING PETROLEO BRASILEIRO, S.A.

(As approved by Congress and sanctioned by President Vargas, October 3, 1953)

CHAPTER I—PREAMBLE

Art. 1—The following constitute a monopoly of the Union:

(I) The prospecting and development of petroleum deposits and other fluid hydrocarbonates and rare gases existing in national territory;

(II) The refining of national or foreign petroleum;

(III) The maritime transportation of national crude oil or petroleum derivatives produced in the country, as well as the transportation by pipeline of crude oil and its derivatives and also that of rare gases whatever their origin.

Art. 2—The Union shall exercise the monopoly established in the preceding article:

(I) through the National Petroleum Council as the policy and supervisionary agency;

(II) through the stock company Petroleo Brasileiro S.A. and its subsidiaries constituted as described in the present law as the executive agency.

CHAPTER II—THE NATIONAL PETROLEUM COUNCIL

Art. 3—The National Petroleum Council, an autonomous agency, directly subordinate to the President of the Republic, shall supervise the measures concerning national supplies of petroleum:

Sec. 1: By national supplies of petroleum is meant the production, importation, exportation, refining, transportation, distribution and trade in crude oil, either from wells or shale, as well as its by-products;

Sec. 2: The utilization of other fluid hydrocarbonates and rare gases are also included under the supervision of the National Petroleum Council:

Art. 4—The National Petroleum Council shall continue to be governed in its organization and functioning by existing laws and the changes arising from the present law:

Sec. 1: The President of the Republic shall issue new statutes for the National Petroleum Council, bearing in mind the stipulations of this article.

CHAPTER III—STOCK COMPANY PETROLEO BRASILEIRO S.A. (PETROBRAS) AND ITS SUBSIDIARIES

Art. 5—Under the terms of this law the Union is authorized to incorporate a stock company to be denominated Petroleo Brasileiro S.A. which will use the abbreviation Petrobras:

Art. 6—Petroleo Brasileiro S.A. shall have as its purpose the prospecting for, extracting

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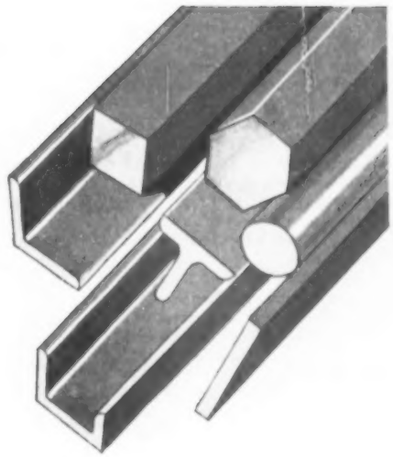

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and refining of, trade in and transportation of petroleum, either from wells or shale, and its by-products, as well as any other co-related activities or purposes:

Sec. 1: the prospecting and development conducted by the company shall be in accordance with the plan organized by it and approved by the National Petroleum Council, without the formalities, area limitation exigencies and others judged to be dispensable in view of Decree-law 3236 of May 7, 1941, the Council authorizing them in the name of the Union:

Art. 7—The president of the Republic shall designate by decree the Union's representative in the acts of constitution of the company:

Sec. 1: the acts of constitution shall be preceded by:

(I) the study and approval of the proposed organization of the basic services of the company, either internal or external;

(II) the listing, with complete specifications, of the assets and rights to be allocated by the Union to complete its capital;

(III) the drawing-up of the statutes and the prior publication of these for general knowledge:

Sec. 2: The acts of constitution shall consist of:

(I) approval of the valuation of the assets and rights listed for paying up of the Union's capital;

(II) approval of the statutes;

(III) approval of the plan of transfer of the services to pass from the National Petroleum Council to the company and the respective allocations:

Sec. 3: the company shall be constituted in a public meeting of the National Petroleum Council, the minutes of which shall incorporate the approved statutes as well as the listing and resumé of the acts of constitution, specially the valuation of assets and rights converted into capital:

Sec. 4: the constitution of the company shall be approved by Executive Decree and its contract registered by means of an authenticated copy with the Register of Commerce:

Art. 8—the statutes of the company shall, insofar as it is applicable, observe the norms covering stock companies. Any change in the statutes implying modification of this law shall depend on legislative authorization and, in other cases, be subject to the approval of the President of the Republic, to be made by decree.

Art. 9—The company shall have an initial capital of Cr4,000,000,000 (4 billion cruzeiros) divided into 20,000,000 shares of common stock, registered, of 200 cruzeiros each:

Sec. 1: up to 1957 the capital shall be increased to a minimum of 10,000,000,000 cruzeiros (ten billion) under the terms of Article 12;

Sec. 2: the company's stock shall be common voting and preferential non-voting, inconvertible into voting stock, while any increase in capital may be either, wholly or partially divided into preferential stock the issuing of which need not be ruled by the restriction of Article 9, Decree-law No. 2627 of September 26, 1940;

Sec. 3: the preferential stock shall have priority in reimbursement of capital and the distribution of a minimum dividend of five percent;

Sec. 4: the company's stock may be grouped in multiple blocks of 100 to 100,000 shares, the grouping and splitting of which may be regulated by the statutes according to the wishes of the stockholder:

Art. 10—The Union shall underwrite the total initial capital of the company, which shall correspond to voting stock and for the paying up of which it shall have the use of the assets and rights it holds, relating to petroleum, including permission to use oilwells, bituminous and pyrobituminous shale deposits and natural gases: in any capital increase, it shall also underwrite common stock which shall assure it of at least 51 percent of the voting capital:

Sec. 1: should the value of the assets and rights referred to in this article, calculated according to the appraisal approved by the National Petroleum Council, not be sufficient to complete payment of the capital, the Union shall do so in monies;

Sec. 2: under the hypothesis foreseen in the preceding paragraph, the National Treasury is authorized to advance, for the account of the revenue from taxes and contributions for completing the company's capital, or to carry out credit operations in anticipation of revenue, up to the amount of Cr1,500,000,000 (one billion five hundred million);

Sec. 3: without onus, the Union shall transfer to States or Municipalities in whose territory oilwells and bituminous or pyrobituminous and natural gas deposits are discovered, respectively, eight and two percent of the stock referring to the value attributed to such deposits, which shall be incorporated with the capital of Petrobras, when constituted, or later:

Art. 11—The transfer by the Union of capital stock, or the underwriting of capital increases by entities or persons to whom this right is conceded by this law, cannot under any circumstances lead to the reduction to less than 51 percent, not only with regard to the voting stock owned by the Union but also its participation in the formation of the capital:

Sec. 1: any transfer or underwriting of stock infringing this article shall be null and void, the request for such action being permitted to third parties by popular request:

Art. 12—periodic increases of the company's capital shall be made from the revenue mentioned in the following articles:

Art. 13—That part of the revenue from the sole tax on liquid fuels referred to in article 3 Law No. 17499 of November 28, 1952, shall be divided as follows:

(I) the 40 percent pertaining to the Union for stock in the company until the paying up of the capital called for in Sec. 1, Article 9, is guaranteed and eventually in subscribing to debentures;

(II) the 60 percent pertaining to States, the Federal District and Municipalities shall be invested;

(a) in stock of the company until the paying in of capital according to plans approved by the National Petroleum Council is guaranteed, the participation of each entity to be at least proportional to the respective quota of the sole tax;

(b) in debentures of the company, or stock and debentures of subsidiaries, the proportional participation of the respective contributions being always guaranteed to the States, Federal District and Municipalities;

Sec. 1: the quota of the National Highway Fund, pertaining to the entities mentioned in Item II, may be withheld if any obstacle is placed in the way of the investment of the percentage specified in the referred item for the purposes and under the terms established in this article:

Art. 14—The revenue from the Import and Excise taxes on automotive vehicles and the tax on remittances abroad referring to the importation of such vehicles and their parts and accessories, shall be utilized by the Union for the underwriting of the stock and debentures of the company:

Art. 15—The proprietors of terrestrial, aquatic or air vehicles shall, up to fiscal year 1957, contribute yearly the assessments described in the accompanying schedule and shall receive, the stipulations of Article 18 being observed, certificates which will be substituted for the company's preferred stock or debentures which will contain an express declaration of this right, the complete responsibility of the Union being guaranteed under any hypothesis for the nominal value of such bonds;

Sec. 1: the acts referring to automotive vehicles within the competency of the Union can only be carried out after payment of the contribution referred to in this Article: the Government shall promote covenants or agreements with other public authorities so that, at the time of the yearly licensing of such vehicles within the limits of their competency, their collaboration in this respect is assured:

Art. 16—The revenue referred to in Article 13, 14 and 15 shall be paid into the special account or accounts in the Bank of Brazil:

Sec. 1: through the intermediary of the representative designated under the terms of Article 7, the Union may utilize the resources allocated by this law to Petrobras, in accordance with instructions from the Ministry of Finance, to meet respective expenditure prior to its constitution;

Sec. 2: even though the shares corresponding to the increase of capital may not yet have been distributed, the company may utilize the special accounts referred to in this Article:

Art. 17—The company may issue, up to the limit of double its paid up capital, bearer debentures, with or without the Treasury's guarantee.

Art. 18—Guaranteeing the preference to public national entities (government agencies), the statutes of the company may admit as stockholders only the following:

(I) public national entities;

(II) the Bank of Brazil and mixed-economy companies created by the Union, States or Municipalities, which companies, by force of law, are under the permanent control of the Public Authorities;

(III) native-born Brazilians, or those naturalized for more than five years and resident in Brazil, either single or married to Brazilians or foreigners when not under the regime of communal property or any other permitting the transfer of rights arising from the marriage, the purchase of common stock being limited to 20,000 shares;

(IV) private companies organized in accordance with the stipulations of Art. 9, line 'b' of Decree No. 4071 of May 12, 1939, the purchase of common stock being limited to 100,000 shares;

(V) private companies, Brazilian, in which only those persons indicated in Item III participate, the purchase of common stock being limited to 20,000 shares.

Art. 19—The company shall be managed by an Administrative Council with deliberative functions and an Executive Board:

Sec. 1: the Administrative Council shall be constituted as follows:

(a) One president nominated by the President of the Republic, dismissible 'ad nutum', having the right of veto over the decisions of the Council itself and the Executive Board;

(b) Three directors nominated by the President of the Republic, with a three-year mandate;

(c) Councillors elected by public entities, except the Union, to a maximum of three, with a three-year mandate;

(d) Councillors elected by private persons and companies, to a maximum of two, with a three-year mandate;

Sec. 2: the number of Councillors shall be fixed in the proportion of one to every 7.5 percent part of the company's voting capital underwritten by those mentioned in letters 'c' and 'd' of Sec. 1;

Sec. 3: the Executive Board shall be comprised of a president and three directors nominated by the President of the Republic;

Sec. 4: only native-born Brazilians may be members of the Administrative Council and the Audit Council;

Sec. 5: an 'ex-officio' appeal to the President of the Republic, after hearing by the National Petroleum Council, may be made against the veto of the president referred to in letter 'a' of Sec. 1;

Sec. 6: the first three directors shall be nominated to mandates of respectively one, two and three years so that the mandate of a director expires yearly:

Art. 20—The Audit Council shall be comprised of five members with three-year mandates:

Sec. 1: the Union shall elect a representative, private persons and companies another, and the remaining public entities three, guaranteeing in this manner to each group of stockholders representing one-third of the votes the right to elect separately a member:

Art. 21—The Audit Council of Petrobras shall have the attributes laid down in Article 127 of Decree-law No. 2627 of September 26, 1940, Decree-law No. 2928 of December 31, 1940, not being applicable.

Art. 22—The acts for the formation of the company and the paying in of its capital, as well as the properties it owns and the purchase of assets and real estate it makes, and still further the instruments of mandate for exercising the right to vote in General Assemblies shall be exempt from taxes and assessments and any other fiscal onus coming within the competency of the Union which shall consult with other administrative entities requesting them to extend the same favors to the company in which they will participate, within the sphere of their taxing competence:

Art. 23—The company shall enjoy exemption from import duties and taxes with regard to machinery, its parts and accessories; apparatus; tools; instruments and material for the construc-

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tion, installation, expansion, improvement, functioning, development, conservation and maintenance of its installation for the purpose for which it is constituted;

Sec. 1: all the material and merchandise referred to in this paragraph shall be cleared through customs by virtue of an edict issued by the customshouse inspectors, with the restriction only as to similarity with national products:

Art. 24—The right to expropriate under existing legislation shall be guaranteed to the company:

Art. 25—Always depending on prior and specific approval from the National Petroleum Council, the company may only guarantee financing, either in the country or abroad, in favor of subsidiary companies providing the operation in the case that foreign capital has no real connection;

Sec. 1: The Executive may extend the guarantee of the National Treasury up to 25 percent of the respective paid-up capital to the financing obtained abroad by the company or its subsidiaries when, because of the magnitude of the operation and the high national interests involved, this becomes necessary:

Art. 26—Only when dividends reach eight percent shall the general stockholders meeting determine the percentages or bonuses for the account of profits for distribution to the administration of the company:

Art. 27—The company and its subsidiaries are obligated to pay to the States and Territories in which the former develop oil and shale oil deposits, or extract gas, an indemnization equal to 5 percent of the value of the oil, shale or gas extracted:

Sec. 1: the value of the oil and shale shall be determined by the National Petroleum Council;

Sec. 2: the payment referred to in this article shall be made each quarter;

Sec. 3: the States and Territories shall distribute 20 percent of what they receive to the Municipalities, proportionally, according to the oil production of each, this payment to be made quarterly;

Sec. 4: the States, Territories and Municipalities should invest the revenue determined in this Article preferably in the production of electric power and the paving of highways:

Art. 28—The Union may call on the company to carry out services conducive with its objectives, for which purpose it shall appropriate special funds:

Art. 29—The rights referring to concessions and authorizations regarding mineral oil wells, refineries and pipelines which the company receives from the Union shall be inalienable, even when Petrobras might cede its right to utilize these as an economic value to any of its subsidiaries:

Art. 30—Should expropriation not take place, Petrobras shall indemnify landowners at a just value for the damage caused through drilling or development:

Art. 31—In accordance with the orientation of the National Petroleum Council, Petrobras shall maintain a minimum co-efficient of oil reserves at the oil fields:

Art. 32—Up to March 31 of each year, Petrobras and its subsidiaries shall forward the general accounts of the company to the General Accounting Office, referring to the preceding fiscal period, which shall be forwarded by the latter to the Chamber of Deputies and the Federal Senate;

Sec. 1: the General Accounting Office shall limit itself to the issuing of a report on the accounts forwarded to it. After taking knowledge of these, without judging them, and of the report of the General Accounting Office, National Congress shall adopt, by either of its two Houses, the supervisionary measures it judges to be convenient:

Art. 33—Petrobras's management and those of the companies subsidiary to it are obligated to submit the information requested from it by National Congress with regard to its acts and decisions:

Art. 34—When a stockholder is a government agency examination of the company's papers and documents will be permitted for the purpose of audit of its accounts:

Art. 35—The statutes of Petrobras shall prescribe specific norms covering the participation of its employees in the company's profits which shall be effective until Item IV of Art. 157 of the Constitution shall, in a general manner, be covered by regulations:

Art. 36—Military or civil servants of the Union, autonomous agencies and mixed-economy companies may be employed in Petrobras in the managerial or technical fields, in accordance with Decree-law No. 6877 of September 18, 1944, though they may not accumulate wages, bonuses or any other advantages under the penalty of being considered to have renounced their original posts;

Sec. 1: in the hypothesis that the National Petroleum Council should reduce its personnel, Petrobras shall give preference (to these) for the filling of posts or jobs according to the aptitude of the released personnel:

Art. 37—The stipulations of line 'c' of Article 2, Decree-law No. 538 of July 7, 1938, shall not be applicable to the directors, employees and stockholders of Petrobras, whose employees and civil servants in general, including those of the National Petroleum Council, may be stockholders:

Art. 38—The company shall contribute toward the preparation of the technical personnel necessary for its services, as well as qualified labor, by means of specialized courses which it will organize: it may, also, concede grants to educational establishments in the country or scholarships for study abroad, as well as other adequate means:

Art. 39—The company shall operate directly or through its subsidiaries, organized with the approval of the National Petroleum Council, in which it must always hold the majority of the voting stock:

Sec. 1: in the composition of the remaining capital, the same criterion established for Petrobras shall be observed, the proportion referred to in Art. 13, Item II, letter 'b' and the preference established in Art. 40 being guaranteed.

Sec. 2: the managerial posts of the companies referred to in this Article shall be prerogatives of native-born Brazilians, whenever the companies' objectives be any of the activities of the petroleum industry:

Sec. 3: in the constitution of the managerial and supervisionary boards of the subsidiaries analogous criteria to those established in this law shall be adopted, with further guarantees to government agencies, having relevant interests in such companies, of representation on the executives board:

Art. 40—Preference shall be guaranteed to the States, with the participation of its Municipalities, in whose territory the crude oil is extracted, in the participation of up to 20 percent of the capital of the subsidiary companies for refining or distribution:

Art. 41—On authorization of the President of the Republic, issued by decree and after consultation with the National Petroleum Council, Petrobras may, without the limitations foreseen in Article 39, associate itself with entities whose purpose is petroleum development outside national territory, providing Brazil's participation or that of Brazilian entities is covered by treaty or covenant in such cases:

Art. 42—The stipulations of Articles 22, 23, 24, 33 and 36 are equally applicable to the company's subsidiaries.

Art. 43—Refineries now in operation in the country are excluded from the monopoly established by the present law and the concessions for pipelines in the same situation are maintained:

Art. 44—Authorizations to install refineries in the country issued up to June 30, 1952, shall not be prejudiced, except should they not be functioning within the periods pre-determined up to the present date:

Art. 45—Authorizations to expand the capacity of the refineries covered by the two preceding articles will not be given:

Art. 46—Independently of special legislative authorization Petrobras may participate as a stockholder in any of the refining companies covered by the preceding articles for the purpose of converting them into its subsidiaries:

Sec. 1: in the cases covered by the present article, Petrobras shall purchase a minimum of 51 percent of the stock of each company:

Art. 47—Tankers privately owned and now used in the specialized transport of petroleum and its by-products are excluded from the monopoly established by the present law:

Art. 48—Special assessments and any others for prospecting for which concessionary companies are obligated under the form of the existing law, as well as the fines levied on those holding authorizations or concessions for any activity relating to liquid hydrocarbonates, shall be for the purpose of subscribing to the stock and debentures of the company or its subsidiaries by the Union:

Art. 49—The mixed-economy companies referred to in Item IV of Article 18 shall be exclusively those existing on the date of validity of this law, their partners or stockholders being released from the proof of Brazilian nationality:

Art. 50—Whenever the National Petroleum Council must deliberate on subjects of interest to the company, the company's president shall participate in the plenary sessions though without the right to vote:

Art. 51—In the regulations covering this law the Executive shall determine the relations between the company and the National Petroleum Council:

Art. 52—The balance of the budgetted allocations and additional credits for the National Petroleum Council, for the fiscal period within which Petrobras shall begin to operate, corresponding to services, obligations, work, equipments and purchases, or any others related to activities passing to the company, shall be handed over to the company immediately it is constituted;

Sec. 1: These amounts shall be credited to the paying up of the Union's capital:

Art. 53—Of the revenue from the sole tax on liquid fuels and lubricants covered by Law No. 1749 of November 28, 1952, 48 percent shall be allocated to the States and Federal District, the distribution being made separately for the products from national raw materials and for imported products or imported oil;

(I) that part of the revenue allocated for enterprises connected with the petroleum industry (Art. 3, Law No. 1749 of November 28, 1952) shall be invested as called for in Article 13 of this Law;

(II) that part of the revenue for the National Highway Fund shall be invested in accordance with the stipulations of Law No. 302 of July 13, 1938, and Law No. 1749 of November 28, 1952;

Sec. 1: the revenue resulting from the products from national raw materials shall, according to the stipulations of the previous items, be distributed to the States and the Federal District in the following manner:

(1) 18 percent proportionally to areas;
(2) 36 percent proportionally to population;
(3) 36 percent proportionally to consumption;
(4) 10 percent proportionally to the production of crude oil or shale or even from condensates;

Sec. 2: the revenue resulting from the imported derivatives or those produced from imported Federal District in the following manner:

(1) 20 percent proportionally to area;
(2) 40 percent proportionally to population;
(3) 40 percent proportionally to consumption;

Sec. 3: the proportions of consumption foreseen in the preceding paragraphs will be calculated on the basis of the quantities consumed in each federal unit and not on the tax paid;

Sec. 4: the distribution of the quota of 12 percent of the sole tax attributed to the municipalities shall also, where applicable, be made according to the criteria of the preceding paragraphs;

Sec. 5: the new criteria established in the present article shall be effective only in 1954:

Art. 54—Yearly the National Highway Department shall invest in highway works in the Federal Territories an amount not less than the quota which would be allocated to each should they participate in the distribution foreseen in Article 53 of this Law, to be based on the collection of the preceding year:

Art. 55—The precepts of labor legislation as related to Petrobras shall be applicable to the company's employees:

Art. 56—This law shall be effective as of the date of its publication, contrary stipulations being hereby revoked.

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BRITISH OIL NEWS

By E. Lawson Lomax

In recent months, owing to the comparatively large number of launchings of new tankers, the question has arisen about the future building program of these vessels in British shipyards. The post-war shortage of tankers has to a certain extent been overcome by the new, larger and faster vessels which have been built in recent years, and as a consequence charter rates have become much easier except perhaps those for clean carriers, owing to the small numbers of such vessels available. It would appear, however, that there will be no great recession in rates in the future, and the tendency is for them to become more stable.

Many of the older tankers, such as the former utility vessels of about 10-12,000 dwt with speeds of 10 to 12 knots, as well as the utility tankers of the T2 class built during the war, are either obsolescent or becoming so through various causes. In addition, they are not so economical to run as the later tankers of higher capacity and greater speed, and owners will soon have to consider the question of scrapping them and replacing them with faster and more economical vessels, even at a much higher initial cost.

The duty of the majority of the new supertankers built since the war is that of transferring crude petroleum from the source of supply to the refining centers, which in many cases are several thousand miles apart; in fact these vessels can be classed as floating pipe lines.

Suppose a refinery is situated some 5-6,000 miles from a crude production center and modern super-tankers of 26-28,000 tons with a speed of 15 knots are used to transport the crude: then, at present building prices, the prime cost of the tankers to carry out this service would be at least 50 percent more than the capital cost of the refinery, while the running costs could be double the running cost of the refinery.

Tanker owners must therefore scrutinize most carefully the allocation of new capital available in order that it may be used in the most efficient manner and it is this scrutiny which in future will in a large manner determine the amount of new tanker tonnage to be built, as against that scrapped as obsolescent.

On the other hand, the world consumption of petroleum is increasing annually and as yet there are no signs that this increase will stop or fall below the average increase of about five to six percent over recent years.

The increase amounts to about 30 million tons per year and while it is not all consumed thousands of miles away from the source of production, the USA still remaining a producer and consumer of approximately 50 percent of the world's total, yet an increasingly greater demand for tankship tonnage is indicated.

Taking a conservative figure of ten million tons, which would appear to be the potential yearly increase of production in Middle East fields situated far from consumption areas, this growth alone would call for a yearly increase of about 1½ million dwt in the world tanker fleet, to which has to be added the tonnage which in future will have to be scrapped. It would appear that the shipbuilders will have many years of good order books in front of them, providing always that vessels can be built at a price which will permit economical operation.

D'Arcy Drilling in Lancashire

In order to determine the underground structure in the Formby area in Lancashire where numerous ground seepages exist, D'Arcy Exploration Co. has started a shallow-bore drilling program, which, if it confirms underground folding indicating the possibility of an oil reservoir, will be followed by deeper drilling. One bore has been completed at 900 feet, and seven others will be drilled to about the same depth in an area about one mile east of the present field. A second area to the west of the field will be drilled later.

Shell to Produce Insecticides at Pernis

A factory for the production of Aldrin and Dieldrin insecticides, manufacture of which has hitherto been confined to the USA, is scheduled for immediate construction and completion by mid-1955 at Pernis (Holland) by Shell Petroleum Co.

These complex chemicals, whose names were coined from the well-known chemical synthesis, the Diels-Alder reaction, have already proved their values as insecticides for the control of soil insects, cotton pests, locusts, ants and many other insects, while the extreme potency and long residual action of Dieldrin make it invaluable for public health work.

The plant for the manufacture of these chemicals from petroleum bases will cost in the neighborhood of £1 million and will produce quantities sufficient to satisfy Shell's requirements as well as the needs of other insecticide manufacturers wishing to use them as base material in the manufacture of their own products.

New Aero Camera

Williamson Manufacturing Co., aviation camera specialists, have developed a new "Roving Eye" camera having a special moving mirror-lens system which enables an aircraft flying eight or nine miles up to film an area that at present takes a battery of eight cameras to cover. The camera is divided into two parts, one sweeping the area to the left of the aircraft, while the other operates to the right, there being a small overlap which is dead vertically beneath. This arrangement gives a wide angle shot of some 90°. The "Roving Eye" effect is achieved by focusing each of the telephoto lenses, there being one on each side of the camera, on its own pivoting mirror, each mirror sweeping the ground to give the wide angle of coverage.

Personnel

Owing to increased volume of business, Vickers Armstrong Ltd. has decided to organize its activities into three divisions, namely: aircraft, engineering and shipbuilding. P. H. Muirhead has been appointed managing director of the engineering division, and G. H. Houlden managing director of the shipbuilding division. G. R. Edwards is managing director of the aircraft division, comprising Weybridge and Supermarine works. T. Gammon takes over the office of general manager of that division. Sir James Reid Young is chairman, and Major-General C. A. L. Dunphie deputy chairman and managing director of the company.

G. Beresford Clark has been appointed sales manager of lubricants for Regent Oil Co. Ltd. He formerly was manager of marine sales. In his new position, in addition to the marine division, he will have charge of automotive and industrial sales in the United Kingdom.

Ian McLeod has joined the Process Engineering division of Sharples Centrifuges Ltd., where he will direct studies of applications of Sharples centrifuge equipment to industrial uses. Mr. McLeod was formerly chief engineer for Premier Mill Corp., Geneva, N. Y., producing processing equipment for the chemical and oil industries.

On the completion of 30 years service with Esso Petroleum Co. Ltd., George Powell was presented with a diamond-pointed gold star by Leonard Sinclair, chairman, at a special meeting of the directors. Until a few years ago, Mr. Powell was manager of the British office of the company, where he directed operations throughout South Wales and the Southwestern counties, a position he held for 15 years before being promoted to a senior position in the head office as co-ordinator of supplies and shipping.

Launch "Esso Westminster"

The turbine-driven super-tanker "Esso Westminster," first of two similar vessels being built by Vickers-Armstrong Ltd. to the order of Esso Transportation Co., was launched from Barrow shipyard on September 24. The principal dimensions are: length overall, 628 feet; breadth molded, 82 feet 6 inches; deadweight to summer draft, 26,500 tons; and speed, 16 knots.

The launching and naming ceremony was performed by Mrs. Howard W. Page, wife of the chairman of Esso Transporation Co., in the presence of a party of distinguished guests.

This vessel is unique in various ways, primarily because the design is basically American, the specifications having been adapted to British techniques and equipment. This has required very close co-operation between the designers and the builders.

Another feature is the large capacity of the cargo pumps, which are capable of a discharge rate of about 3,500 tons per hour, while the intake lines are arranged in such a way that a loading rate of 5,000 tons per hour is envisaged. These discharge pumps are steam turbo-driven and are made by Drysdale & Co.

The vessel is propelled by a single 4-bladed screw of 20 feet diameter driven by a set of geared turbines of Parons' type Pametrada design, developing 12,500 shp at 112 revs. and 13,750 shp at 115 revs.

Steam is supplied to two Babcock & Wilcox integral furnace type water tube boilers of 850 psi working pressure and 850° F temperature at superheated outlet, the boilers being arranged to burn oil fuel only.

Introduce New Larger Tank Truck

Owing to relaxation of restrictions on gasoline gallonage allowed to be carried in road tankers, the capacity of these can now be increased from 3,000 to 4,000 gallons, and Shell-Mex & B. P. Ltd. have introduced the biggest motor spirit road tank wagon so far operating in Britain.

This is an eight-wheeled A.E.C. "Mammoth Major" which will be used for transport of bulk supplies from refineries and main installations to depots, thereby reducing handling and distribution costs. The new tanker weighs over eight tons in normal running trim and the spirit load which can be carried is approximately 13.5 tons. All eight wheels are fitted with 36 X 8 tires. Thompson Bros. (Bilston) are makers of the tank and fittings.

Radiographic Inspection at Kwinana

Both X-rays and gamma rays will be used for radiographic inspection of the large amount of welding required during the construction of the Kwinana refinery of the Australasian Refinery Co. Ltd. For the gamma radiography, radioactive isotopes will be flown to Australia from the atomic research station at Harwell. These isotopes are supplied in amounts about half the size of the little finger and can advantageously be used in places normally inaccessible to X-ray equipment.

Anglo-Iranian to Install Sixth Platformer at Kent

Decision to install a platformer of 250,000 tons per year capacity at the new Kent refinery brings the total of these units ordered by Anglo-Iranian to six. With the exception of the one for the new Aden refinery, whose capacity is 500,000 tons per year, all the units are of 250,000 tons per year capacity.

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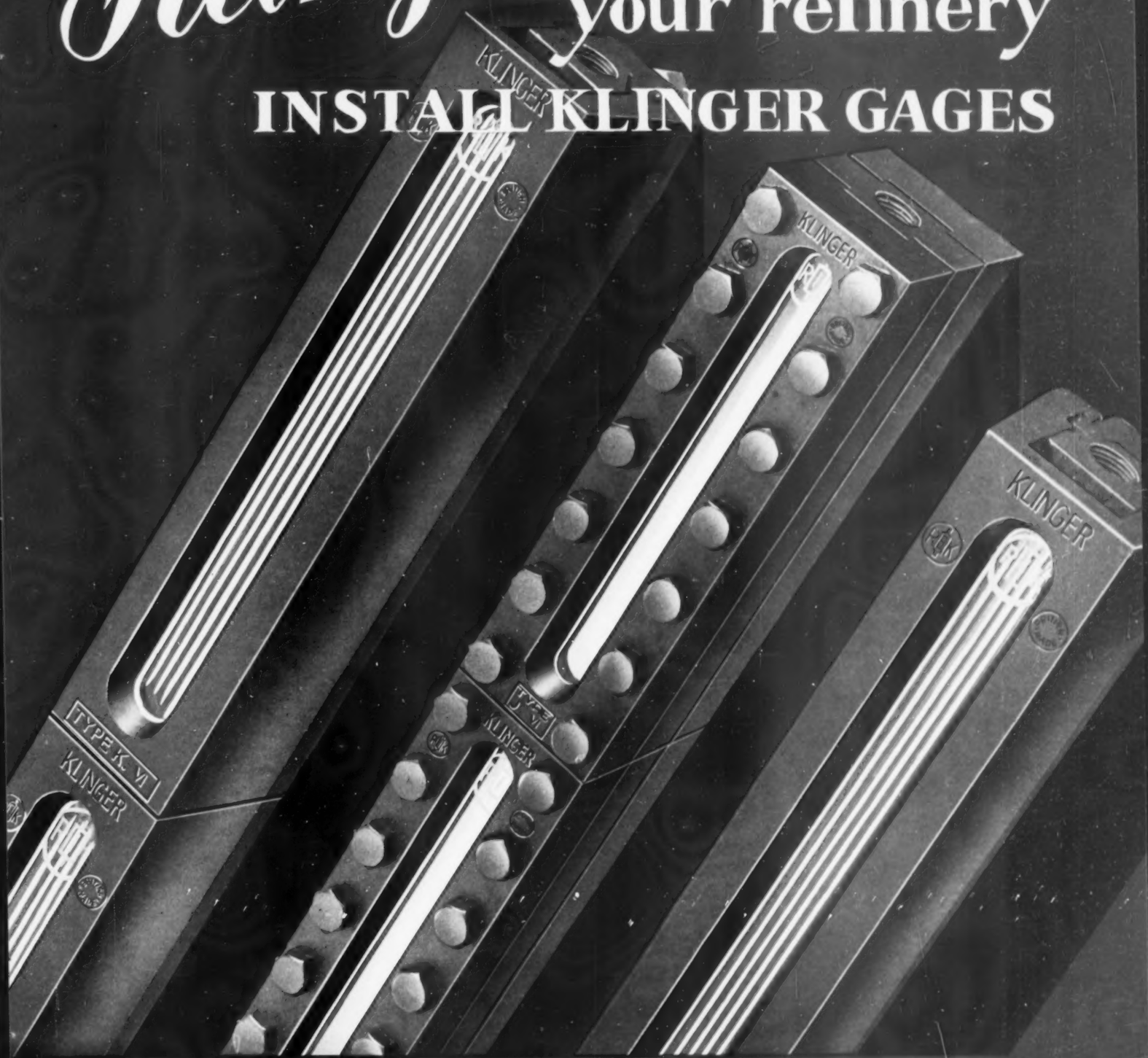

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Pressure Maintenance in Eastern Venezuela

Water conditioning system at West Guara which filters and injects 3,000 b/d into one reservoir. Water supply comes from the run off of the wet oil heater treaters.

(Continued from page 103)

proximately 900 psi below virgin pressure, while cumulative production was 32 percent of the initial oil in place.

Three of the four outlets in this sand were located close to the oil-water contact and, in an attempt to promote natural flow without the edge water reaching the level of the producing wells, the reservoir was closed in for pressure build-up. When the pressure had risen some 150 psi, the wells were reopened and have since yielded approximately one million barrels of oil by natural flow. Presently, the formation pressure of the L-2 reservoir is over 1,800 psi and it is producing 1,000 b/d at nearly the solution gas/oil ratio. An ultimate recovery of 50 percent may be realized.

Chimire Field

The Chimire field was discovered by Socony in 1948 and Mene Grande's first well was completed in February 1949. Since that time, competitive drilling has rapidly expanded the field until it has reached major proportions and as yet the areal extent is not completely defined.

Gas is being injected into the L-4 sand, one of the largest of the 25 productive horizons in Chimire, and another reservoir is being considered for pressure maintenance. In reality this program is expected to be a pressure build-up rather than purely maintenance of the current pressures.

The L-4 sand consists of two sandstone members with a net pay thickness varying from 10 to 50 feet. The upper member is rather uniform and highly permeable throughout the reservoir, while the lower is dirty, silty and tight. Because of the rapid development drilling in this area, the reservoir pressure had declined from 2,600 psi, its initial pressure, to about 1,900 psi. It was realized from the beginning that it would be necessary to control the production on a field-wide basis without regard to individual lease ownership if natural energy were to be conserved and the highest ultimate recovery obtained. Consequently, an agreement on the unitization of the two major sands of the Chimire Field was reached and a compressor plant constructed. This plant is capable of delivering 30,000 mcf of gas per day.

Nipa Field

The central Nipa area has two sands, the G and L_{2m}, into which gas is being injected. During the first half of 1953 there was installed in this field a combined pressure maintenance and gas lift plant which will be capable of supplying some 5,500 mcf of gas per day at 2,300 psi injection pressure when it is entirely in operation. Presently, 4,000 mcf of gas are being injected at 1,800 psi.

The G sand is a lenticular sand with accumulation caused by its thinning on both sides and being cut by a fault on the south, with an oil-water contact downdip to the north. The pressure decline was that of a combination solution gas and gravity drainage reservoir and it soon became evident that the natural drive had to be augmented in order to sustain natural flow. The original reservoir pressure of the G sand was 2,785 psi and by the time injection was initiated it had dropped to 1,842 psi. During this period, the reservoir produced some 13 percent of its initial oil volume. Since injection was started in March, the reservoir pressure has decidedly leveled off and is now giving indications of a rise.

The L_{2m} reservoir is a local channel deposit with an average thickness of 13 feet, having no appreciable variation in lithology throughout its entirety. It lies at a depth of 7,900 feet. The accumulation is accounted for by the thinning of the sand eastward and westward, the Laysme fault to the south and the oil-water contact downdip to the north. Through what little information is available this is believed to be a solution gas drive reservoir, aided by gravity drainage.

In the early part of 1949, when the first outlets of this L_{2m} sand were opened, the pressure was measured at 3,080 psi. At the time of the initiation of injection it had declined to 2,057 psi because of withdrawal of some 2,400,000 barrels of oil. This is a pressure drop of 33 percent for a 24 percent yield, which undoubtedly is a good proportion; but since the pressure decline rate had increased considerably the past year, it is very evident that the ultimate yield would not be as high as desired if gas injection had not been utilized. By pressure maintenance, an additional 750,000 barrels of oil, or approximately 7½ percent additional of the initial oil in place, should be recovered, and the depletion time considerably shortened. The last measured reservoir pressures show indications of a slight increase since pressure maintenance of this sand began.

Mapiri Field

There are a number of reservoirs in the Mapiri field under consideration for gas injection. These sands lie at depths between 8,500 and 10,500 feet subsurface. They are generally fine to coarse grained, lenticular sands, fairly homogeneous, with some shale streaks. The accumulation is accounted for by these north-dipping sands pinching out to the east and west while being cut updip to the south by the Mapiri fault. The reservoirs are producing by solution gas drive, aided by gas cap expansion.

The original pressures measured in these reservoirs were in the range of 3,500 to 4,000 psi. Since the early part of 1949, development drilling has been intensive, causing a rapid decline in reservoir pressures. Practically all well completions in the Mapiri Field were multiple zone. Here again the difficulty of maintaining the casing zones on natural flow production would be encountered long before a reasonable percentage of oil was produced.

During 1952, plans for a pressure maintenance program were drawn up and before the end of September 1953 gas injection into the U-2 sand began. Injection rates will be about 7,500 mcf per day. With this program in operation, the casing zones will continue to produce by natural flow and a substantial increase in ultimate recovery can be expected over the previously estimated 22 percent by primary methods. When depletion is realized, this reservoir will have some 30 billion standard cubic feet of gas in storage at a pressure of over 2,600 psi. It is noteworthy to mention that this will be one of the deepest sands known to date into which gas is being injected.

Summary

Figure 1 shows graphically the increase in production from the reservoirs undergoing pressure maintenance by gas, and also indicates the gradual and uniform decrease which the daily rates will undergo until depletion.

It must be realized that when gas injection started in most of these reservoirs, they were still capable of producing by natural flow; but even though the pressure decline was cushioned by encroaching water and expansion of free gas, it was realized that artificial stimulation would be needed to sustain natural flow throughout the lives of the wells. Through pressure maintenance significant advantages are achieved besides increased ultimate oil recovery. Notable ones are the reduction in the investment for artificial lift equipment, shorter depletion periods, and finally, a vast conservation of natural gas which will be ready for the use of a greater industrialized Venezuela of the future; a creditable contribution of our great petroleum industry.

INTERNATIONAL NEWS AND NOTES

J. G. Spratt

Spratt Named President of Trans Mountain

J. Grant Spratt becomes president of Trans Mountain Oil Pipe Line Company effective Jan. 1, 1954, succeeding R. L. Bridges, who has been president of the company since it was originally formed. While resigning the presidency, Mr. Bridges will continue as a director.

In commenting on the change in officials, S. D. Bechtel, chairman of the board, said: "When Mr. Bridges was elected president of the company in 1951, he accepted the responsibilities of organizing and developing the company with the definite understanding that when it began operating, he would retire in favor of a highly qualified Canadian operating oil man. Mr. Bridges has accomplished the job he set out to perform not only efficiently, but most expeditiously; in fact, the pipe line has been completed and is now ready for operation several months ahead of the original schedule. While Mr. Bridges' resignation has been accepted with sincere regret by the board, the company is fortunate that he will continue as a director.

"The election of Mr. Spratt as president is in accordance with the company's fundamental policy that the permanent operating organization shall be made up of Canadians. Mr. Spratt has been associated with the western Canadian petroleum industry for most of his life and has been among the outstanding leaders in its development. The Trans Mountain operating organization is very fortunate in obtaining him as its president."

Mr. Spratt, who was born in Hawkesbury, Ontario, has been associated for the past 15 years with Anglo-Canadian Oil Co. Ltd., of which he has been president since May 1953. He will continue as a director of that company. He also has been serving as a director of Calmont Oils Ltd., and during 1950 was president of the Western Canadian Petroleum Association.

To Represent Bank of Montreal

J. A. Richards, attached to the Bank of Montreal's superintendent's department, Calgary, for the past two years, has been appointed special representative in Calgary. He will be in charge of the bank's business development in the oil fields of Alberta. Mr. Richards joined the Bank of Montreal at Edmonton in 1929.

New Poly Plant At Venice Refinery

A catalytic polymerization plant has been commissioned at the Porto Marghera refinery of Industria Raffinazione Olii Minerali, near Venice, jointly owned by Anglo-Iranian Oil Co. and Azienda Generale Italiana Petroli. Since 1948 the productive capacity of the plant has been increased from 8,000 barrels daily to 28,000 barrels daily. A catalytic cracking unit is to be installed at the refinery within the next two years.

On Special Assignment in Venezuela

Mitchell W. Breedlove, sales and service representative for The Guiberson Corp., has been given a special assignment in Venezuela, according to an announcement by Harry S. Zane, Jr., sales manager of Guiberson. With temporary headquarters in Caracas, Mr. Breedlove will offer technical advice and assistance to drillers and producers on the use and applications of Guiberson oil field equipment. Mr. Breedlove has extensive first-hand knowledge of this equipment, having been with Guiberson since 1936 in various capacities as machinist, engineer and sales and service representative. Export representatives for Guiberson are Beckley, Halton and Hickman of New York City. Mr. Zane plans an early personal tour of Venezuela and other South American oil producing areas.

M. W. Breedlove

Toronto Iron Works Appointment

Arthur J. Le Blanc has been appointed executive assistant to G. E. Ellsworth, president of Toronto Iron Works Ltd., and Central Bridge Co. Ltd. Following his discharge in 1947 from the Royal Canadian Engineers with rank of Lieutenant-Colonel, Mr. LeBlanc became associated with Atlas Construction Co., later becoming a director. In 1951 he joined Hollinger-Hanna Ltd. as assistant general manager, and has been engaged in the Quebec-Labrador iron ore development since that time.

Brazil Finds New Field

Engineer Pedro Moura, in charge of operations in Bahia, announces the discovery of a new field at Pojunca, 36 miles from Salvador and in the center of the Reconcavo oil basin. The wildcat found oil at 4,556 feet and is being drilled deeper to test a lower horizon. The president of the Petroleum Council, in an address to the Geological Society in August, said that 355 wells have been drilled to date, the total depth amounting to 2,883,429 feet, and that 14 drills are now in use. The President added that the Council's greatest need is for more technicians to speed up its work.

Cities Service Enters Peru

The Peruvian Pacific Petroleum Co., a wholly-owned subsidiary of Cities Service Co., has acquired approximately 300,000 acres of exploration and exploitation lands in the Talara producing area on the coast of Northern Peru. The acquisition is under a contract with the Empresa Petrolera Fiscal.

The company has also entered filings on 20 exploration concessions totaling 2,405,000 acres in the Montana region of Eastern Peru. In this same area The Texas Petroleum Co. (Peru), the Socony-Vacuum Oil Development Co. (Peru), and Richmond Oil Corp. (Standard of California) have recently made applications for similar tracts.

The new Cities Service subsidiary is entering into a working agreement with the Richfield Oil Corp. whereby each company will participate in the exploration and exploitation on a fifty-fifty basis. In the initial stage the principal operations will be geological work and exploratory drilling.

New Yugoslav Field

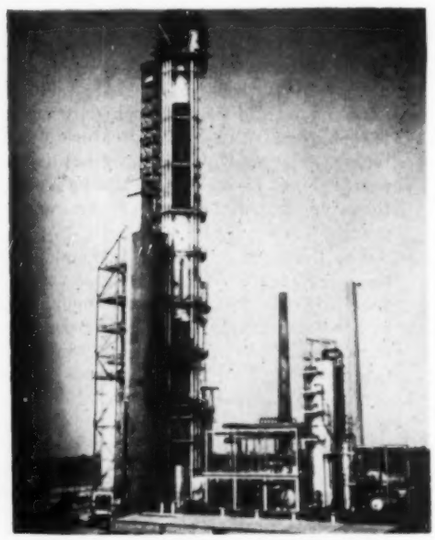
A new oil field has been discovered in the vicinity of Velika Greda, Yugoslavia. The well produced 20 metric tons the first day, and 30 on succeeding days during a test period. Pending construction of transport facilities, the well has been temporarily shut in.

First German Houdriflow on Stream

Houdry Process Corp. has announced that the Gewerkschaft Erdoel-Raffinerie Emsland refinery in Lingen, Germany has completed installation of a Houdriflow catalytic cracking unit. It is the principal processing unit in a completely new refinery. This 17,500 b/d cat cracker circulates synthetic bead catalyst at the rate of 525 tons per hour and has a coke burning capacity of 11,000 pounds per hour. The unit is designed to treat and partially de-sulfurize light coker and straight run distillate products. The refinery currently processes a mixture of Georgsdorf and Emlichheim crudes.

The Emsland Houdriflow cat cracker employs a novel processing scheme whereby a Lummus coking unit constitutes part of the feed preparation section for the Houdriflow unit. Total vaporizable effluent from the coker flash tower passes directly to the cracking tower together with gas oils from the topping plant. This integrated arrangement eliminates intermediate storage, thereby reducing operating and equipment costs.

Houdry Process Corp. designed and licensed the Houdriflow catalytic unit. Engineering and construction of the plant was handled by The Lummus Co. A Houdry operating crew is in Germany for the start-up.



Houdriflow unit at Gewerkschaft Erdoel-Raffinerie, Emsland refinery, Lingen, Germany.

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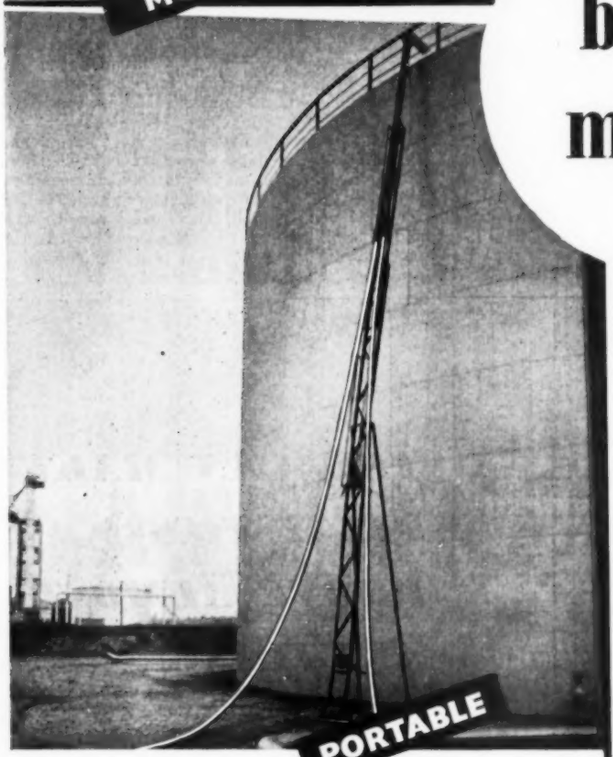

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Organize for Fourth World Petroleum Congress

Work for the preparation of the Fourth World Petroleum Congress, to be held in Italy in June 1955, is progressing. The Italian organizing committee met in Rome on June 19 and July 22. M. Boldrini, vice president of AGIP, has been elected chairman of the committee, succeeding E. Santoro, who resigned. Vice presidents of the committee have also been appointed. A. Muston, of Esso Standard Italiana, has been named general secretary. Financial, technical, editing, and logistical committees have been formed.

Twenty five countries have communicated their desire to participate in the Congress, 18 of which have formed national committees to organize active participation.

The Italian Technical Committee, headed by Prof. C. Padovani, met in Milan June 26 to examine titles of papers from Italian authors. A selected list of papers, from which 15 papers will be chosen, has been prepared. Preliminary lists of papers have also been sent to the Italian organizing committee from different national committees of the various countries.

Deadline for the submission of summaries and authors' names to the organizing committee was set at October 1, 1953 in order to allow a sufficient time for the preparation of lists grouping papers by congress sections and by general subjects or topics. The permanent council will meet in Rome next January to make final selection of papers presented by different countries in order to reduce them to the overall agreed number of 150.

Cardon Refinery Booklet

A booklet describing the 170,000 b/d refinery recently completed by Shell Caribbean Petroleum Co. at Cardon, Venezuela, has been published by The Lummus Co., New York. The booklet tells the story of the building of the plant from the day in 1945 when first site survey work was done until April 1953, when the entire installation was completed.

Executives of Creole Petroleum Corp. met recently at the semi-annual coordination conference of the producing, refining and marine divisions. They are, (left to right), J. J. Horigan, president of the Lago Oil and Transport Ltd. division; R. W. Miller, vice president of Creole in New York, who directs the crude oil sales program; and A. T. Proudfit, president of Creole. The conference was the first function held in the new three million dollar air-conditioned Hotel del Lago.

Third Wafra Well Completed

American Independent Oil Co. has completed the third well in the Wafra field in the Kuwait-Saudi-Arabia Neutral Zone as a 3,000 b/d producer. The well is located a mile south and a mile east of the discovery. Additional wells will now be drilled on a one-mile spacing pattern to develop the field. A second rig now is en route to the field.

All wells remain shut-in pending the completion of a pipe line to the Persian Gulf terminal facilities some 30 miles distant, construction of which is well advanced. American Independent is operator for the joint account of itself and the Pacific Western Oil Corp., which holds a one-half interest in the Neutral Zone.

Lane-Wells Opens Canadian Office

Lane-Wells Canadian Company has opened a new sales office in Regina, Saskatchewan, Canada. Ray E. Benjamin, well known geologist, is in charge of the office, located at 1913 South Railway Street.

AIOC Invests in Canada

Announcement that D'Arcy Exploration Co. Ltd., drilling subsidiary of Anglo-Iranian Oil Co. Ltd., has negotiated the acquisition of a substantial interest in Triad Oil Co. Ltd. of Calgary, Alberta, Canada, marks the first important step of AIOC in extending its activities to Canada, an area that has been under study by representatives of the company for the past two years.

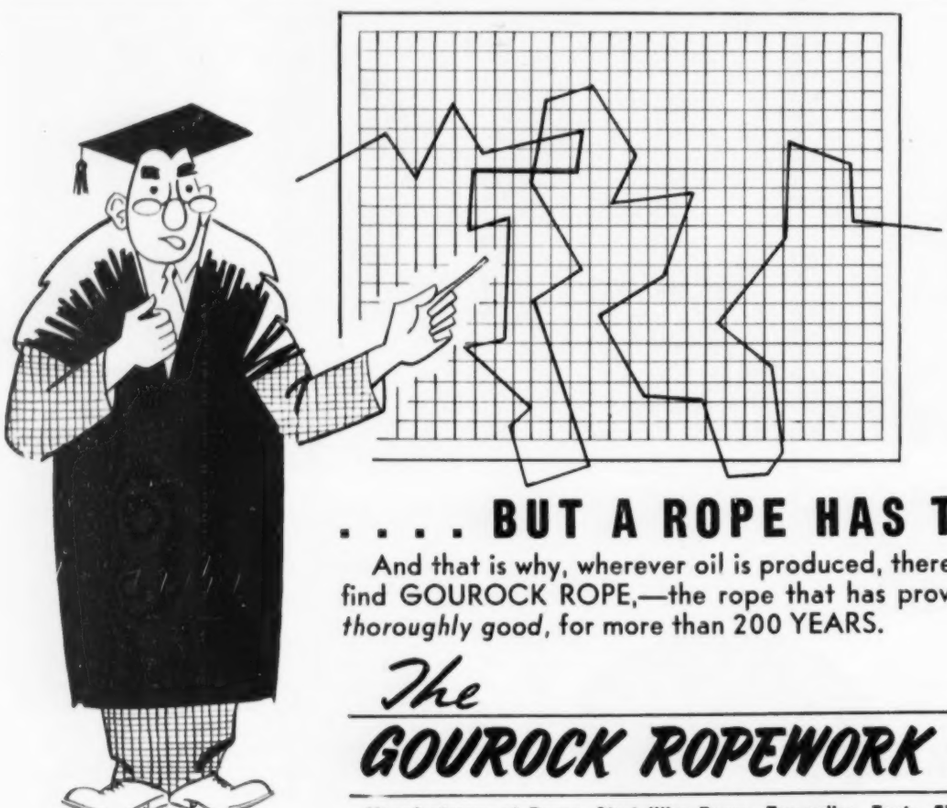
The agreement, subject to approval by Triad's shareholders, provides for sale by Triad to D'Arcy of a total of 1,750,000 no-par shares and $875,000 of 4½ percent convertible notes, representing an investment of about $5 million, according to the announcement. D'Arcy is given the right to subscribe enough additional financing later to bring its interest in Triad to 50 percent.

Triad, incorporated in 1951, has interests in acreage in Alberta, Saskatchewan and the Williston Basin. It produced about 375,000 barrels of oil in the year ended November 30, 1952, mainly from the Redwater field in Alberta. Triad's capital is listed as $2,885,000 in 4½ percent convertible debentures and 5,740,484 shares of no-par stock.

Brazil-Bolivia Oil Agreement

An agreement was signed in August at La Paz under which Brazil and Bolivia will contribute one million dollars each towards the cost of drilling for Bolivian oil in the Department of Santa Cruz. Brazil's contribution will be repaid in oil. The area to be exploited is distinct from the Chamarj-Choreti structure. It embraces approximately 300 square kilometers between the Rivers Ichilo and Parapeti.

The Rio press announced that "Yacimientos Petroliferos Bolivianos" has authorized Glenn McCarthy Enterprises to prospect, drill and exploit petroleum in the southeastern part of Bolivia for a 35 year period. The company will pay a sliding scale of royalties, ranging from 16 to 40 percent, on gross production, and furnish capital, equipment and materials valued at $5 million.



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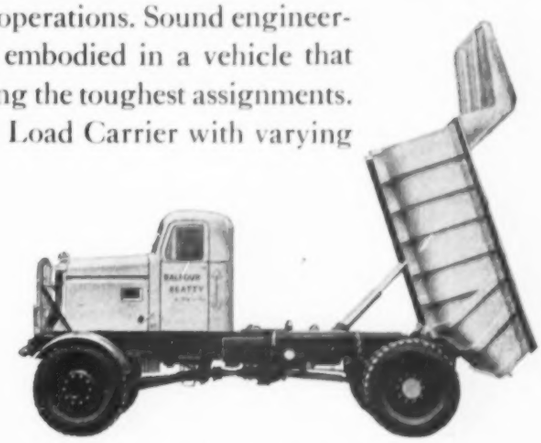

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OIL COMPANY STAFF CHANGES

IRENE STIMSON COX of San Antonio, Texas, was chosen president of the Association of Desk and Derrick Clubs of North America at the second annual convention in Denver, Colo. Mrs. Cox is secretary, treasurer and director of the Panhandle Producing Co. and is a partner in the firm of Cox and Compton. She is a member of several petroleum and civic organizations. She is currently serving Desk and Derrick as first vice-president.

Other officers named for the year 1954 are: Meitzie A. Palmer, Los Angeles, first vice-president; Sybil Sureck, Oklahoma City, second vice-president; Lorene Porter, San Antonio, secretary; and Angela Cross, Pittsburgh, treasurer.

Elected directors for the seven regions of the Association were Elinore McAdam, Newark, Region I; Elouise Norris, Oklahoma City, Region II; Bea Freyou, Baton Rouge, Region III; Minetta Miller, Denver, Region IV; Lydia Babka, San Francisco, Region V; Dorothy Kassell, Fort Worth, Region VI; and Betty Heaton, Edmonton, Canada, Region VII.

WALTER HOCHULI, who has been general manager of the domestic sales department of The Texas Co. for eight years, and who has been in ill health for some time, has retired. He will continue to serve Texaco in an advisory capacity if his health permits. S. C. Bartlett has been appointed to succeed Mr. Hochuli. He was assistant general manager. He was first employed by Texaco 29 years ago as a service station pump operator in Denver.

Other promotions in Texaco's sales department include: W. B. Hawke, manager, dealer sales, with headquarters at New York, has been appointed assistant general manager (administration); C. H. Dodson, assistant to the executive vice president, has been promoted to manager, dealer sales. J. E. Fritts, assistant manager of northern territory with headquarters in New York, has been appointed assistant to the vice president, domestic sales department.

L. L. HENNING has been named manager of the Bakersfield refinery of Standard Oil Co. of California, succeeding M. M. Moore, who has retired. Mr. Moore was head of the Bakersfield plant for the past ten years. He joined Standard in 1913 as a chemist in the company's El Segundo Refinery and later served in managerial capacities at both El Segundo and Richmond Refinery.

Mr. Henning, previously superintendent of the Richmond Refinery chemical division, has been with Standard since 1934. He started in the company's general engineering department and for the past 12 years has been in the cracking division at Richmond.

E. P. ADDITON has been appointed sales engineer for Blaw-Knox Co., chemical plants division. He will be located at Pittsburgh and will serve industrial clients in a five-state area.

Mr. Additon is a chemical engineer and a graduate of the University of Maine. Prior to his present assignment, he held engineering positions in the Chemical Plants Division over a ten-year period, and had earlier employment with the Barrett Division of Allied Chemical and Dye Corp. and Calco Division of American Cyanamid Co.

HAROLD E. BRYSON has been appointed manager of a new marketing division of Sinclair Refining Co. He will be responsible for the sale of petroleum products that are used as materials in the manufacture of other products such as waxes, petrolatums, resins and industrial asphalts. He formerly was manager of the company's wax and petrolatum division.

RICHARD E. LAUTERBACH has been named manager of General Petroleum Corporation's manufacturing department. Since last November he has been manager of the new Ferndale refinery which is now under construction. Mr. Lauterbach joined General Petroleum in March 1936 immediately after his graduation from the University of California. In 1945 he was assigned to the company's Torrance refinery as a refinery engineer. He became assistant manager of the refinery in 1950.

EDWARD BARRETT, Oklahoma City, geologist for Continental Oil Co., has been promoted to the newly created position of regional research geologist, central region. He will continue to make his headquarters at Oklahoma City.

R. P. RITCHIE has been elected vice president in charge of transportation and supplies of Shell Oil Co. of Canada Ltd., Toronto. He has been manager of the transportation and supplies department. He is a director of Portland Pipe Line Corp., Montreal Pipe Line Co., and Trans-Northern Pipe Line Co.

Mr. Ritchie joined Shell in 1934 and since that time has had varied experience in different phases of the company's operations. He graduated from the University of Toronto in 1933 in mechanical engineering, following which he completed a year's post-graduate work in business administration at the University of Western Ontario.

A. W. SCOTT, president of Wolf's Head Oil Refining Co., Oil City, Pa., was re-elected president of the National Petroleum Association at Atlantic City. This will be his second term as NPA president. Other officers reelected were: Fred G. Dannerot, Jr., Elk Refining Co., Charleston, W. Va., first vice president; Paul R. Beck, Pennsylvania Refining Co., Butler, Pa., second vice president; Fayette B. Dow, Washington, D.C. general counsel; G. B. Hunter, Quaker State Oil Refining Corp., Oil City, Pa., treasurer; and Margaret A. Miller, Washington, D.C., assistant treasurer.

L. R. DICKINSON has been appointed vice-president and general manager of Trans-Mountain Pipe Line Co. Prior to assuming his present appointment, he was manager of the eastern pipe lines division of the Socony-Vacuum Oil Co. in New Jersey. He will make his headquarters at the company's head office in Toronto.

BEN HALSELL has been promoted to assistant manager of Texaco's 14-state northern sales territory with headquarters in New York. He was sales manager of the Chicago division, where he is succeeded by C. W. Krueger.

DR. RICHARD V. HUGHES has been appointed technical assistant to the vice president, Gulf Oil Corp., Houston division, succeeding Paul Weaver, who retired recently. Dr. Hughes came with Gulf in June 1953 from Stanford University, where he had served successively as visiting lecturer, professor and head of the department of petroleum engineering since 1949. While at Stanford, he also did some consulting work in secondary oil recovery and spent last summer with Gulf working on oil production problems.

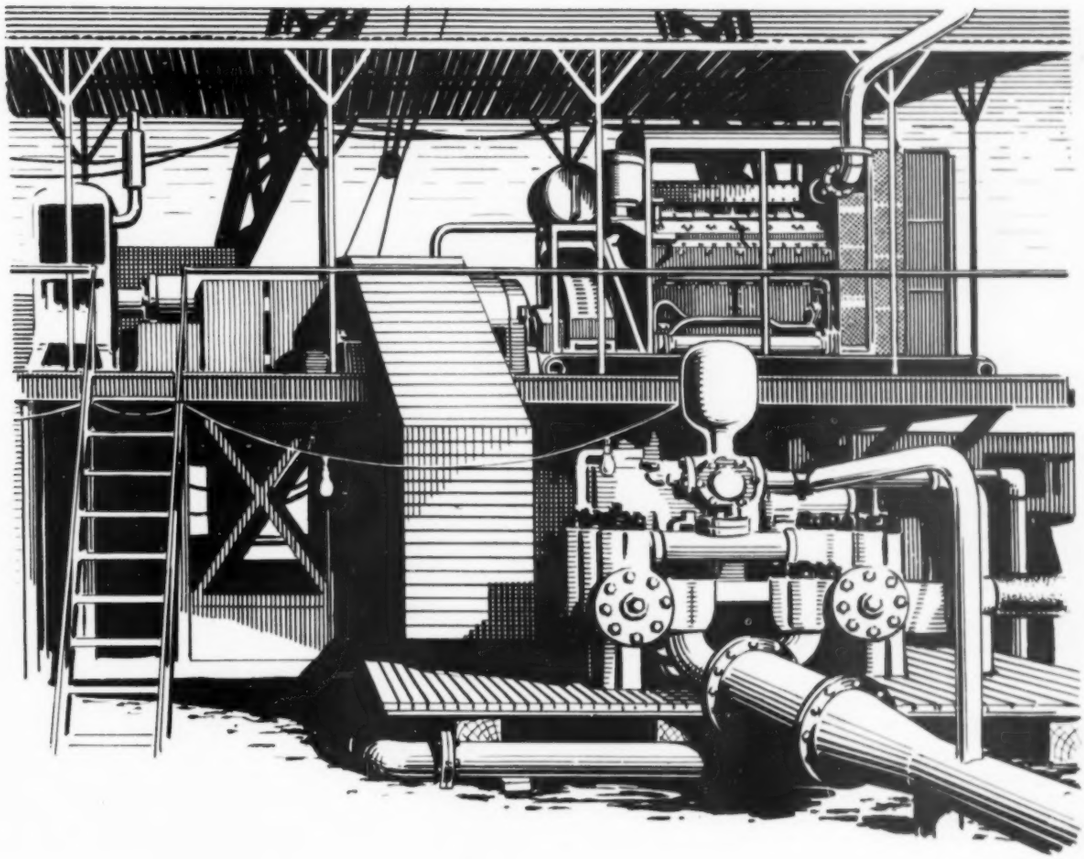
Dr. Hughes' work has taken him as far afield as South America. From 1926 to 1929 he was draftsman, geologist and magnetometer operator for Lago Petroleum Corp. in Venezuela and from 1935 to 1942 he was with Tropical Oil Co. in Colombia, serving ultimately as chief geologist.

R. E. Lauterbach

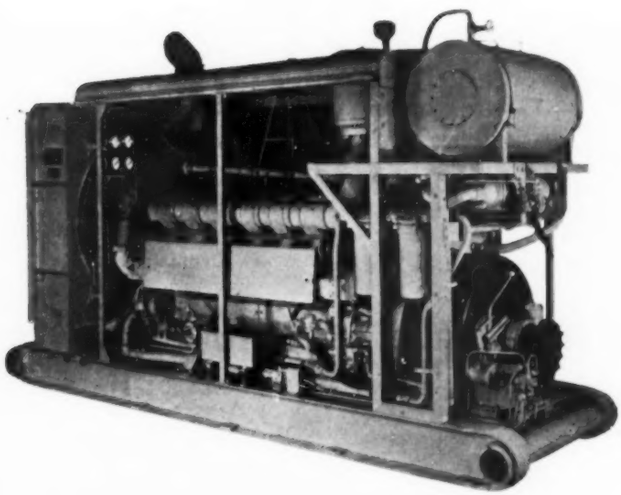
R. P. Ritchie

L. R. Dickinson

Dr. R. V. Hughes



IT TAKES A GOOD ENGINE . . .



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N. T. Stover *R. E. Luton*

N. T. STOVER has been elected vice president in charge of marketing and R. E. Luton vice president in charge of refining of The Ohio Oil Co. Mr. Stover was formerly general sales manager and Mr. Luton was manager of the refining division. Establishment of the two new vice presidential offices follows the recent election of C. Z. Hardwick as executive vice president. Previously, Mr. Hardwick headed both functions as manager of refining and marketing.

Beginning his career with The Ohio Oil Co. in 1913 as a messenger in the Findlay office, Mr. Stover later entered the accounting department. He was promoted in 1927 to sales manager of Lincoln Oil Refining Co., Ohio's marketing subsidiary. When the Lincoln company was dissolved in 1935, Mr. Stover was appointed wholesale sales manager of the parent company. He advanced to general sales manager in 1946.

Mr. Luton studied chemical engineering at Marietta College. Serving as assistant superintendent and chemist of the Lincoln Oil Refining Co. at Robinson, Ill., he became associated with Ohio in 1924 when Ohio Oil acquired Lincoln Oil Refining. In 1929 he advanced to vice president and general superintendent of the Lincoln company. With the dissolution of that company in 1935, he was appointed general superintendent of refineries of The Ohio Oil Co. He was named manager of the refining division in 1947.

HAROLD F. MOSES has been elected president of Interstate Natural Gas Co. of Monroe, La., and general manager of the oil and gas division of Olin Industries, Inc. He succeeds George A. Wilson, who was named chairman of Interstate. Mr. Moses resigned as director and vice president in charge of exploration and research of Carter Oil Co. to accept his new position with Olin. He joined Henry L. Doherty and Co. in 1925 and for nine years engaged in geological exploration in South and Central America, culminating in 1933 as general manager of their Mexican operations. The following year he accepted an assignment with the Turkish Government to review that country's petroleum resources. He joined Carter in 1935.

DELPHA L. ANDERSON, assistant sales manager of Vickers Petroleum Co., Inc., has been promoted to sales manager. Mr. Anderson has been associated closely with the oil marketing business for the past 25 years. He began his career as a gasoline distributor and operated his own business handling Vickers products for seventeen years. He joined the sales staff at Vickers in 1948.

JAMES B. SMITH, formerly executive vice president of the Vickers Petroleum Co., Inc., Wichita, Kansas, has been named a vice president and manager of sales for Sunray Oil Corp. He will also become a member of Sunray's management committee. Mr. Smith has been with Vickers since 1937 and has been a director and vice president of that company since 1941. He has served as a director and officer in Sovereign Service, Inc. since 1940.

J. J. FROMMER, manager of The Ohio Oil Company's Shreveport production division since 1944, retired August 1, closing 34 years of service with the company. W. B. Berwald, assistant Shreveport division manager, was appointed to succeed him. Glen B. Gariepy, Los Angeles division geologist, became assistant Shreveport division manager. He is succeeded by R. G. Kurtz, senior geologist at San Antonio, Texas.

With his retirement from Ohio Oil, Mr. Frommer also leaves the chairmanship of the Haynesville and Cotton Valley Operators Committees. He joined Ohio as foreman at Rarger, Texas, in 1919. He moved to Shreveport in 1940 to become assistant division manager and superintendent of production and was appointed division manager in May 1944.

J. J. Frommer *W. B. Berwald* *G. B. Gariepy* *R. G. Kurtz*

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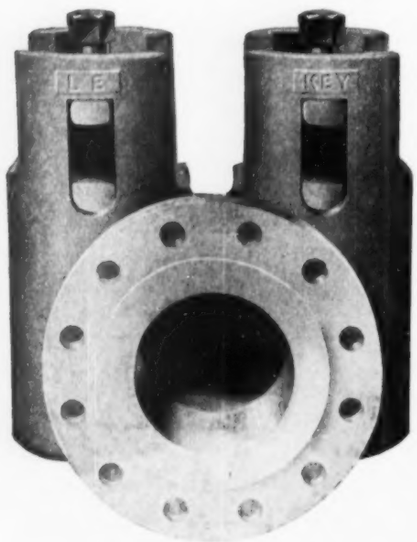

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H. G. Southworth

H. G. SOUTHWORTH has been appointed manager of operations for the Philadelphia sales division of the Gulf Oil Corp. He will be in charge of engineering functions, and the marketing equipment of all bulk plants, water and pipe line terminals and service stations. Mr. Southworth joined Gulf in 1935 after 25 years' experience in the marketing department of another oil company, seven years as chief construction engineer.

WILSON K. MINOR, assistant comptroller of the Standard Oil Co. of California, San Francisco, was named a regional vice president of the Controllers Institute of America at that organization's recent 22nd annual meeting in Boston. Mr. Minor, a member of the Institute since 1938, was elected a director in 1952. He was president of the San Francisco Control for 1950-51.

GEORGE M. PARKER has been elected executive vice president of Esso Export Corp. to succeed L. K. Blood, who has relinquished the position following more than 40 years' service with Jersey Standard's affiliated companies. Mr. Blood will continue, however, as a director and will be available for special assignments.

Mr. Parker was elected a vice president of Esso Export in 1950 when he became its senior representative in Europe, heading up a group coordinating the company's activities there. Previously he had served Jersey as advisor on marketing operations in Latin America and later as marketing advisor for the United Kingdom, Europe, North Africa and the Near East.

Mr. Blood was elected executive vice president of Esso Export in 1948. Prior to this appointment he had served since 1943 as administrative executive assistant in the marketing coordination department of Jersey Standard. He was first employed by the Jersey Standard organization as a clerk in 1912.

G. M. Parker

T. B. Kimball

THOMAS B. KIMBALL has been appointed general manager of refineries for Sinclair Refining Co. to succeed John W. Duckett, who is retiring after 35 years of service with the Sinclair organization.

Mr. Kimball joined the Sinclair organization in 1930 in the Research and Development Department in East Chicago, Ind. Before he was transferred to the New York office in 1943, he was in charge of the cracking division and of the process engineering and development of light oil processes at the East Chicago refinery. In 1950 he was appointed assistant manager of refineries.

FERRIL M. MILLER has been named resident plant engineer for Cities Service Oil Co.'s Chicago terminal and compound plant. He also will head the technical service department of the plant. Roy Petterson will succeed him as resident chemist.

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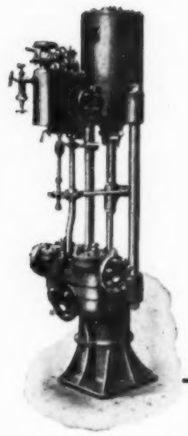

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RICHARD J. DENT and **JAMES T. RASBURY**, formerly of Deep Rock Oil Corp., have established a new law firm in Tulsa, Oklahoma. They will engage in the general practice of law, specializing in labor relations law, oil and gas law and anti-trust law. Mr. Rasbury was manager of the Deep Rock employee and industrial relations division and Mr. Dent served in the legal division.

WILLIAM N. ZAKIS, Durango, Colo., geologist for Continental Oil Co., has been promoted to district geologist with headquarters at Casper, Wyo. He succeeds Gerald F. Bowers, resigned.

RUSH F. CARRIER has been named to the post of assistant general sales manager, eastern division of Tide Water Associated Oil Company. Mr. Carrier joined the company in 1926 as a salesman in the Syracuse, New York district.

R. F. Carrier

A. D. Hill

AUBREY D. HILL has been appointed assistant manager of manufacturing in charge of lubricating oils and waxes for all Sinclair refineries effective October 1. Mr. Hill joined Sinclair at the East Chicago refinery in the development department in 1923, where he worked on both pilot plant and commercial scale lubricating oil and wax manufacture. In 1927 he was transferred to the company's refinery at Coffeyville and later worked at Houston and Wellsville, New York, where he was placed in charge of the technical department and was later promoted to assistant superintendent. He transferred to the New York office in 1944.

PAUL WEAVER has joined the staff of the Texas A. & M. College System as a research geologist. He recently retired as technical assistant to the vice-president of Gulf Oil Corp. He will devote part of his time to teaching seniors and graduate students at A. & M.

FORD L. JOHNSON, manager of Sun Oil Company's physical laboratory at Newton Square, Pa., has been appointed acting director of the research and development activities for the production department of the company. Preston E. Chaney, manager of the production laboratory at Beaumont, Texas, will serve as assistant director in charge of exploitation. C. N. White has been appointed administrative assistant to Mr. Johnson.

W. VAUGHN ISCHIE has been appointed assistant manager of light oil operations of Sinclair Refining Co. He has been assistant to the refineries manager since spending a year at Washington as director of the foreign refining division of the PAD.

Mr. Ischie joined the Sinclair research department at East Chicago in 1920. In 1929, he was transferred to the manufacturing department, later becoming operating superintendent of the East Chicago refinery.

W. V. Ischie

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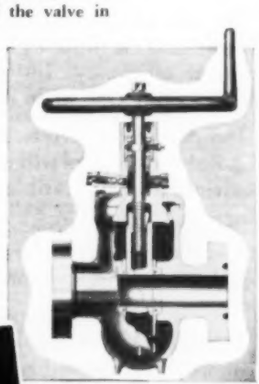

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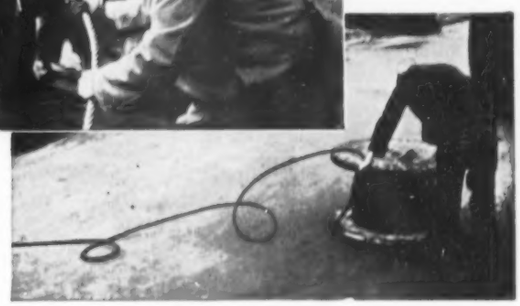

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J. S. Leach

Leach Defends Depletion Allowance

Addressing the Texas Mid-Continent Oil and Gas Association on October 7, J. S. Leach, chairman of the board of The Texas Company, warned of new attacks on depletion allowances and urged that the industry present a united front with respect to oil imports. He also described recent oil price increases as necessary and unavoidable.

Mr. Leach pointed out that petroleum products had increased in price less than five percent since 1948, including the recent increase, while all commodities, excluding farm products, went up 11 percent.

Emphasizing that more than 80 percent of the wildcat wells drilled last year by the industry were dry holes, Mr. Leach asserted that tampering with the depletion allowance "would be suicidal" since its effect would be to abolish incentive to hunt for new oil sources at a time when such sources are urgently required.

New Shell Chemical Plant

Shell Chemical Corp. will build a plant to produce alkyl chloride and epichlorohydrin. Construction will be completed late in 1954. Output of the plant will be used to increase Shell's glycerine production by 25 million pounds per year and to make available substantial additional quantities of epichlorohydrin and Epon resins. It is the first step in Shell Chemical's current glycerine expansion program.

Col. W. F. Rockwell

Col. Rockwell Returns to Company

Col. Willard F. Rockwell, who has resigned as Assistant to Secretary of Defense Charles E. Wilson, has returned to his position as chairman of the board of directors of Rockwell Manufacturing Co. Colonel Rockwell's resignation was submitted in mid-September after he had made his final report following a three-week tour of North Atlantic Treaty Organization member countries.

Leaves Petroleum Technologists

Nick Van Wingen has resigned as vice president of Petroleum Technologists, Inc., Montebello, Calif., to engage in private practice as a consultant. He will continue as a P. T. director. At present he is in Turkey to make an engineering evaluation of two oil fields for the Turkish government.

Elected Pullman Director

Dr. W. E. Hanford, vice president in charge of research and development, The M. W. Kellogg Co., has been elected a director of Pullman, Inc., of which Kellogg is a subsidiary. Prior to joining Kellogg in 1946 he served as a research chemist with the E. I. du Pont de Nemours & Co., and as director of research with General Aniline & Film Corporation.

Dr. W. E. Hanford

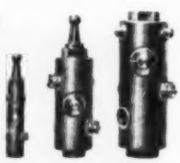
Descale WITHOUT Danger

The Air Motor "Skatoskalo" Set enables the operators to descale and clean tubes in the shortest possible time with the greatest efficiency. The air motor gives more horse-power and does not stall when heavy deposit is encountered.

The Air Motor Driven Set incorporates all the advantages of a Rotary Air Tool without sacrificing the advantages of the electrically-driven Flexible Drive type.

"Skatoskalo" equipment can be used with complete safety and is recommended for the efficient maintenance of cracking plant, boilers, evaporators, condensers, heat exchangers, etc.

Tubes of 5/8" internal dia. upwards can be thoroughly cleaned by "Skatoskalo" Air Tools.



Skatoskalo pneumatic tools deliver 9,000 blows a minute. Other types for surface scaling.

The **"SKATOSKALO"** Single Speed Air-Driven Descaling Machine

Representatives in all parts of the United Kingdom. Principal agents in over sixty countries throughout the world.

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The widest range in the British Empire — made to suit your requirements.
Thousands in service.

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Turbine driven up to 11,000 KW.
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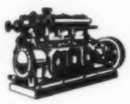

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COMPRESSOR & POWER PLANT SPECIALISTS FOR NEARLY A CENTURY

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Tube Expanders

Six points on a Star Performer

1. Self feeding parallel rolling type.
2. Made to specification or to standard design.
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4. Perfect Finish.
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Osborn 'Titanic' Tube Expanders for Oil Refinery Fittings can be recommended with every confidence.

The High Quality Alloy Steel from which they are made is an Osborn product carrying a world wide reputation for its excellence.

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PIPELINE
Working in conjunction with Canadian Bechtel Limited, Toronto Iron Works, Limited is proud of having designed, fabricated and erected A.P.I. Steel Storage Tanks of a total capacity of 1,500,000 barrels at the Edmonton Terminal of the Trans-Mountain Pipeline.
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J. E. Fogarty

Graver Forms Oilfield Supply Division

From its East Chicago, Indiana headquarters, Graver Tank & Mfg. Co., Inc. has announced the formation of a separate division for the sales and service of oilfield equipment. Known as the Graver Supply Co., this division is under the direction of J. E. Fogarty, midcontinent area manager for Graver's plants in Sand Springs, Oklahoma and Odessa, Texas. As general manager of the new Graver Supply Co., Mr. Fogarty has established sales offices and storage yards in a number of cities throughout the southwest. He has directed Graver's midcontinent fabricating and sales since Graver acquired its Oklahoma plant in 1946.

Gerald G. Byer has been appointed area manager for the Oklahoma-Kansas territory and has set up offices in the Thompson Building in Tulsa. His twin sons, George and Jerry, are manning branch offices in Oklahoma City and Great Bend, Kansas, respectively. Henry F. McCabe covers the district around Ardmore, Oklahoma. Yards for service and storage have been selected in both Ardmore and Great Bend.

A second sales area covers West Texas and New Mexico, headed by J. E. Hobson at Odessa, Texas, where Graver recently located a fabricating plant under G. W. Myer as superintendent. Mr. Hobson is assisted by A. T. Arnold at Odessa and by subordinate sales offices in Hobbs, New Mexico, Abilene and Dallas, Texas. A yard has been purchased in Abilene and other facilities are planned. J. G. Scofield heads the branch office at Hobbs, R. R. Cowan at Abilene and M. J. Bridges in Dallas.

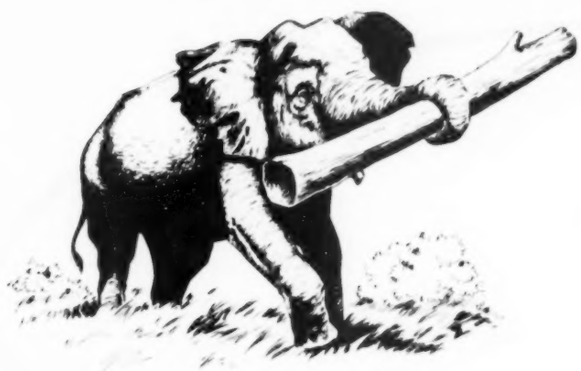
For the Gulf Coast area, arrangements have been made for the marketing of Graver-built well-head equipment from Houston as a center through the Murphy Tank Co., of which E. G. Murphy is president. To provide immediate service, a large storage yard is already in operation at Houston.

The new Graver Supply Co. will market Graver-built lease tanks, both welded and bolted, walkways and stairways, oil and gas separators, and heaters. This equipment has been produced by Graver as a specialty of its Sand Springs, Oklahoma plant and more recently at its Odessa, Texas plant. Henceforth, the sales and service of this equipment will be a specialized function of Graver's newest division, the Graver Supply Co., with headquarters at Sand Springs, Oklahoma.

McKee Treasurer to Retire

J. Krumhansl, treasurer of Arthur G. McKee and Co., will retire on January 2, 1954, after more than 40 years with McKee. H. R. Moorhouse will be the new treasurer. He has been the secretary and director for the past seven years.

As assistants to Mr. Moorhouse, who will be both secretary and treasurer, the board elected Carl H. Ganzenmueller and William R. Nichols to new positions. Mr. Ganzenmueller, at present assistant treasurer, will become assistant secretary and assistant treasurer, and Mr. Nichols, now assistant to Mr. Moorhouse, will be controller.



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This design is typical of Lee C. Moore construction.

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General offices and plant: 6612 Denton Drive, P. O. Box 7206, TWX DL-220, Dallas, Texas, U.S.A. Branch offices throughout the oil country. Authorized export dealers: Otis Pressure Control Export, Inc., 8035 102nd Street, Edmonton, Canada; Servicio Technicio de Pozos "Otis" C. A., Puerto La Cruz, Venezuela.

OTIS PRESSURE CONTROL, Inc.

F. D. St. Hilaire

Heads Graver Construction Sales

Frank D. St. Hilaire has been appointed to the new position of general sales manager of Graver Construction Co., a division of Graver Tank & Mfg. Co., Inc. He will be responsible for domestic and international sales to the petroleum and chemical industries for engineering and construction of new plants and facilities. Mr. St. Hilaire started his career as a refinery assistant 17 years ago in the Caribbean for Trinidad Leaseholds Ltd. He moved up to refinery superintendent and later joined The Texas Co. as foreign technical representative covering Latin America. He was with The Lummus Co. for three years as a coordinating engineer. He joined Graver in 1950 as chief engineer of Middle East operations in Saudi Arabia and Lebanon.

GATX Expands In California

General American Transportation Corp. has opened a Southern California sales office for the company's plate and welding division and appointed Ben King Duffy as district sales manager. The new office is located in the Statler Center, 900 Wilshire Boulevard, Los Angeles. A field erection shop is being constructed at Colton, California, to facilitate erection of Wiggins floating roofs and Wiggins conservation structures throughout the territory. Field erection crews and equipment will be based in Colton where General American also maintains a tank car repair shop. E. D. Rollins is western sales manager, with offices in San Francisco.

Pure to Install Reformer

The Pure Oil Co. has contracted with The M. W. Kellogg Co. for the design and erection of a Sinclair-Baker catalytic reformer at its Heath (Ohio) refinery. Pure is the second company to announce its decision to build a plant using the new catalyst. The Heath plant will process 3,000 barrels of naphtha daily and convert a low octane (about 33) feed to high octane gasoline which will rate about 98 octane with 3 cc. TEL. Provision will be made in the design of the plant for operation on high sulfur naphthas should crude market conditions dictate the use of such feeds. Construction is scheduled to start this fall and completion is expected by the second quarter of 1954.

New Information Service

Petroleum Information, Rocky Mountain fact-finding organization for the oil industry, has announced a new service unique among oil industry service publications. Called "Oil in the Rockies," the new service combines a map of the Rocky Mountain region on which progress of all exploratory drilling is noted, with a concise review of each month's activities in all phases of the oil industry in the region.

"Oil in the Rockies" will be issued monthly as an analysis and forecast of activities in exploration, drilling, refining, and pipe lining. It will also present reviews and summaries of outstanding regional operations.

New Sinclair Building In Chicago

Sinclair Refining Company has signed a 25-year lease for 150,000 square feet of space in a new 10-story office building now being built at West Randolph Street and Wacker Drive, Chicago. The new building will house 800 company central district sales and other personnel.

New Premium Motor Fuel

Cities Service Oil Co. recently announced an improved premium gasoline under the name "Cities Service 5-D extra premium motor fuel." Immediate distribution is in the Eastern marketing territory only. Five claims being made by the company for the new fuel are: (1) high octane; (2) engine cleanliness through its ability to reduce harmful carbon deposits (the company maintains that this is the first gasoline to do this); (3) contains rust inhibitor; (4) upper cylinder anti-oxidant lubricant is added; and (5) anti-stalling.

Orthoflow Hydroformer Planned

Standard Oil Co. (Ind.) will build a new type of fluid catalytic hydroforming unit at its Whiting, Ind. refinery. It will process 30,000 b/d of low octane naphtha. M. W. Kellogg Co. of New York City, the prime contractor, plans to start construction later this year. Completion is expected by the end of 1954.

The new unit will be of the Orthoflow type with catalytic reactor and regenerator in vertical alignment. This unit will hold about 500 tons of a special fluidized molybdena type catalyst. An older fixed-bed hydroformer will continue operating.

Otis Expert Aids French

Carl Schwab, service administrative manager of Otis Pressure Control, Inc., Dallas, arrived in Paris October 5, 1953 to assist the government-owned Societe Nationale Des Petroles D'Aquitaine in the completion of a high-pressure gas well. He is supervising French operations in the installation of various safety devices, surface safety valves, tubing safety valves, bottom hole regulators, and an input safety valve in the completion of the well.

This well is located in southwestern France, and was drilled to a total depth of 12,000 feet where a high pressure formation was encountered. The well has a well head pressure of 7,000 psi and produces gas with a high percentage of hydrogen sulfide. The extremely high pressure and presence of poisonous gas presented an unusual completion and production problem for the French company.

After advising the French company in their testing operations following completion of the well, Mr. Schwab will travel to Italy and Germany to visit offices and field installations in those countries. Among the companies he will visit are Azienda Generale Italiana Petroli at Cortemaggiore, Italy and Gewerkschaft Elwerath in Germany.

C. Schwab

PARSONS

TÜRKİYE CUMHURİYETİ HÜKÜMETİ

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NEW YORK · TULSA · WASHINGTON · ANKARA

L. J. MacKenna

Worthington Transfers MacKenna to Tulsa

L. J. MacKenna has been appointed district office manager of Worthington Corporation's Tulsa office. He has been at the New York district sales office for the past 20 years.

Fomilyant to Manage Macnick

A. A. Fomilyant, Los Angeles district manager of Rockwell Manufacturing Company's meter and valve division, has been named general manager of the company's Macnick division at Tulsa. He succeeds W. M. Connor, who will supervise sales and production liaison between the division's national headquarters at Pittsburgh and divisional plants and field offices. E. M. Cloran, western regional supervisor of gas products sales, succeeds Mr. Fomilyant as division district manager.

Joins Ethyl Information Services Group

John C. Lane has joined the staff of the information services group of Ethyl Corporation's research and engineering department at Detroit. He will assist in the preparation of technical publications in the automotive-petroleum field. Mr. Lane has headed documentation groups at the Gulf Research and Development Co. in Pittsburgh, and the Institute of Gas Technology in Chicago. For the past three years he prepared a monthly summary of petroleum refining developments which received wide distribution in several important companies.

Secretary of the Interior Douglas McKay with (left) Dr. Gustav Egloff and (right) David W. Harris, president of Universal Oil Products Co., enjoying a moment of relaxation at Universal's recent party for members and guests of the National Petroleum Association, The Traymore Hotel, Atlantic City.

New Platformer

Sunray Oil Corp. will build a 5,000 b/d Platforming unit at its Duncan, Okla. refinery. Construction is planned to start about January 1, and estimated completion date is in the third quarter of 1954.

Air Cooled Engines

Winsonsin Motor Corp. has published a new bulletin describing its line of air cooled motors in 1, 2 and 4-cylinder models for oil field, materials handling and construction use. Copies are available from the company at Milwaukee 46, Wis.

Visits Middle East

Douglas Edward Daffin, service operations manager of Otis Pressure Control, Dallas, is in the rich Middle East oil fields helping American oil companies with production problems. He is assisting the Arabian-American Oil Company of Saudi Arabia in the servicing of Otis equipment in the Abqaiq field. He will then go to Kuwait to aid the Kuwait Oil Company (Ltd.) along similar lines.

D. E. Daffin

AT NEW YORK

Producing exactly the right paint for the purpose is greatly helped by co-operation between the factory of International's associated company in New York and the factory in the United Kingdom. The on-the-spot technical knowledge of paint requirements in America is fortified by the accumulated technical experience of the U.K. factory at Felling-on-Tyne—knowledge gathered from "case histories" of painting problems all over the world.

In no less than 15 other countries, *International* have similar associated companies. That is why they can supply paints suitable for anything, anywhere. To the oil industry, for its storage tanks, they send *International* RED LEAD GRAPHITE PRIMER and *International* ALUMINUM PAINT: and for general purposes to the oil industry SUNLIGHT ENAMEL, and many other specialties.

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BURTON DELINGPOLE & CO. LTD. OLD HILL, STAFFS., ENGLAND
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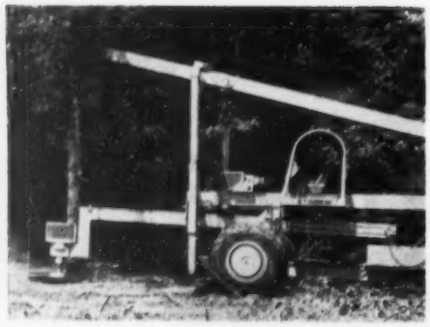


Le Tourneau mobile tree saw.

Clears Two Acres Per Hour

Self-powered, mobile tree saws clearing land at better than two acres per hour were featured in a demonstration of a new line of land-clearing equipment held recently in the East Texas area. R. G. LeTourneau, Inc., Longview, Texas, staged the demonstration. LeTourneau unveiled its new "Tree Stinger" which features a 34-foot telescoping boom that will extend an additional 19 feet. Its purpose is to reach out over streams, sloughs, or steep banks and push or pull over trees not normally accessible to mechanized saws.

The Tournasaw has an electrically-powered saw on a pivoting boom which will selectively cut all the trees in a 250 square foot area immediately in front of the Tournasaw, and an overhead "pusher boom" which directs the fall of trees in parallel positions. The saw cuts trees flush with the ground, leaving no stumps to impede follow-up operations.

Youngstown Engineer Promoted

Carl A. Swanson has been appointed assistant Chicago district engineer for The Youngstown Sheet and Tube Company. He joined the company in 1947 at Youngstown, Ohio.

White to Expand New Autocar Division

Construction will start within a few days in suburban Exton, Pa., on new manufacturing facilities for the recently-acquired Autocar division, it has been announced by Robert F. Black, president of The White Motor Co., Cleveland. White's investment program in Exton, planned to replace Autocar's present plant at Ardmore, Pa., will total more than $2 million. The new construction is expected to be ready for occupancy early in 1954.

Edward F. Coogan, president of Autocar since 1949, is to be named vice president in charge of the Autocar division. He has been with Autocar since 1924. B. B. Bachman will continue as head of engineering and development, and A. Gelpke will continue in charge of production.

Truck Catalog

Oshkosh Motor Truck, Inc., Oshkosh, Wis., has published a new catalog describing its 4 and 6-wheel drive trucks for heavy duty service both on and off the highway. Copies are available on request.

First Cat Cracker in New England

The first catalytic cracking plant in New England, a 24,000-barrel fluid unit at the Everett refinery of Esso Standard Oil Co., was dedicated October 4 by Gov. Christian A. Herter of Massachusetts.

In addition to the cracking unit, other new facilities include a 7,000 b/d rerun pipestill and new and improved light ends facilities. Crude oil throughput has been raised from 38,000 to 50,000 b/d. Modernization of the Everett refinery is part of more than $23 million Esso has spent or earmarked in the last five years for new and improved manufacturing and marketing facilities throughout New England. Among these are two million-barrel storage terminals nearing completion in New Haven, Conn. and Waltham, Mass.

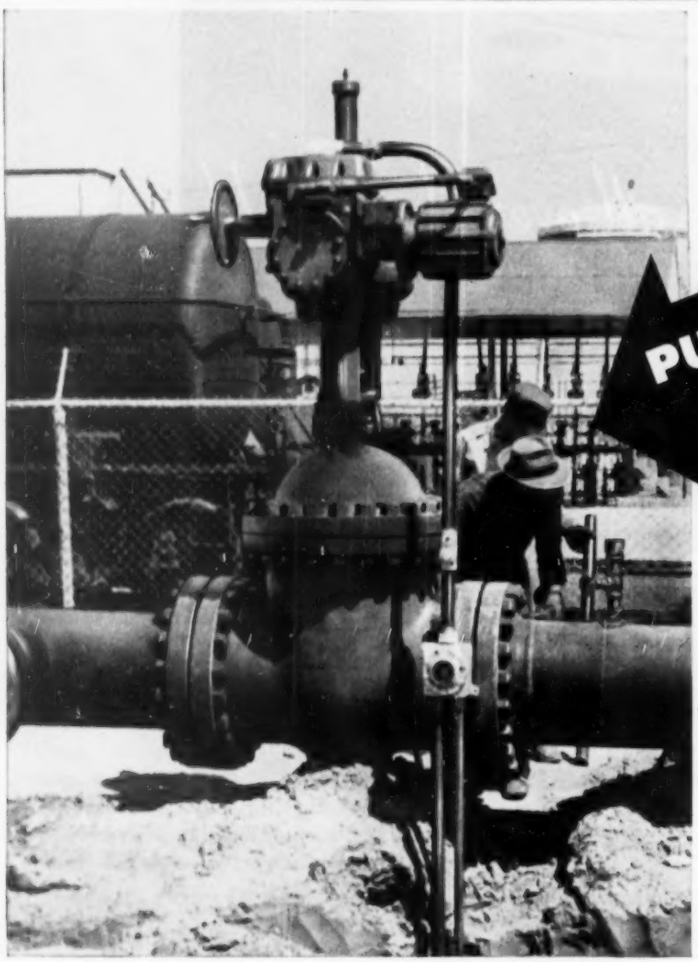
To Build Virginia Refinery

Pan American Refining Corp. has decided to locate its proposed new East Coast refinery in Goodwin Neck, York County, Virginia. Options for the purchase of the intended refinery site have been acquired. Present plans call for commencement of construction within six months, with completion of the refinery scheduled for late 1955. Initial refinery capacity will be 25,000 barrels per day.

Speed Reducer Booklet

A new 15-page booklet, describing the complete line of Westinghouse speed reducers, is available from the Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa. Features of the equipment, manufacturing technique, and applications are discussed in the booklet. Standard ratios available for all types of speed reducers are given. Special units developed for right-angle drives and in-line drives are discussed.

Esso Standard's new cat cracker at Everett, Mass.



Typically, this motor-operated, 18-inch Darling cast steel gate valve, of the fully revolving, double disc parallel seat type, is now cutting costs and maintenance on a major cross-country products line.

DARLING VALVES

PUT IT IN... FORGET IT!

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Darling pipe line gate valve

Despite severe temperature changes and line stresses, Darling pipe line gate valves close tight every time. And they require less maintenance. You get *surer* valve performance, year in, year out.

It's a matter of principle — a unique but simple one — *Darling's fully revolving, double disc, parallel seat* principle! It automatically compensates for valve body distortion, equalizes disc and seat wear, cuts down time and maintenance to the bone!

Get *all* the facts — money-saving facts that make these Darling valves preferred equipment today in all kinds of oil and gas line service everywhere. Simply outline your particular service needs or ask for a complete descriptive bulletin.

SANDILANDS VALVE MANUFACTURING CO., LTD.

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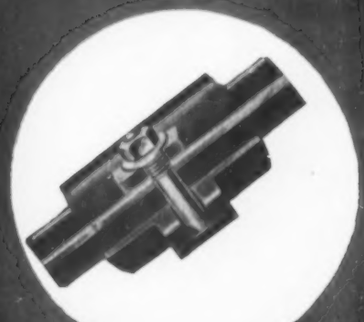
for SPEED and STRENGTH in OILFIELD CONSTRUCTION

BURTON'S PATENT DOUBLE COUPLER
(For coupling upright tubes to horizontal tubes)
R.D. 823,801
PAT. Nos. 507,411 & 602,055

BURTON'S PATENT SWIVEL COUPLER
(For coupling bracing tubes to strengthen scaffold)
PAT. No. 507,411

BURTON'S PATENT COMBINED JOINT PIN AND COUPLER
(For joining two tubes end to end)



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PAT. No. 423,151
BURTON'S PATENT PUTLOG COUPLER
(For fixing Putlogs or transoms to horizontal tubes)

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World Crude Production

(Continued from page 87)

This year the increase in U.S. domestic demand is more satisfactory than in 1952 because the economy has not been disrupted by great national strikes such as the oil and steel strikes of last year. In the first nine months, U.S. demand has been 6.1 percent ahead of last year. The percent of increase may be even higher by the end of the year if November and December should prove to be cold. In 1952 the winter was warm and distillate consumption disappointingly low. Most recent forecast of consumption by the U.S. Bureau of Mines is that the 1953 increase will be about 6.2 percent.

WORLD PETROLEUM (September 1953, p. 64) has estimated that demand outside the United States in 1953 will increase 7.1 percent over 1952 to 5,900,000 b/d on a crude and gas products basis. With a Bureau of Mines forecast of 7,732,000 b/d demand in the United States, it is estimated that crude and natural gasoline demand will average 13,638,000 b/d, an increase of 6.6 percent over the 1952 record of 12,789,000 b/d.

With crude production currently running a little higher than 13 million barrels daily and natural gas liquids averaging 800,000 b/d, it is apparent that there will be some accumulation of stocks again this year as was the case in 1952. Cuts in production in Texas, Oklahoma, Kansas and Louisiana in October will affect this trend if continued in force through December. There have been cuts in Venezuela and in some parts of the Middle East.

The increase in stocks appears to have disturbed oil markets in the United States recently, although in terms of day's supply of all oils, the current stock level is about the same as in recent years. Most disturbing factor appears to be the large stock of motor fuel which has been increasing contra-seasonally in recent months. Furnace oil stocks also have been somewhat heavier than many refiners have been willing to carry.

Concurrent with the recent decrease in crude allowables in the Southwest, there has been a trend toward lower runs to stills. Late in September and early in October, U.S. refiners were operating at 89 percent of rated capacity compared with 94 percent a year ago. Most economists agree that this moderate cutback in runs will correct the soft markets in a reasonably short period, particularly if the weather will cooperate with a few severe cold waves. The present percentage of refinery capacity employed is as great as the averages over the past 10 years. In general, the rate of production and refining is not far out of balance with demand.

It is apparent that the rate of increase in world demand for petroleum is becoming more moderate. At a recent meeting of the Mid-Continent Oil and Gas Association, John G. Winger, petroleum economist of the Chase National Bank, estimated that U.S. oil demand in 1954 will be 4.3 percent greater than in 1953. He suggested that it will be necessary to increase crude production of domestic fields by 3.6 percent and that refinery operations should average 7,400,000 b/d, an increase of 4.2 percent over the present year. Foreign demand, he feels, will increase at a greater rate than in the United States again next year.

With the consumption growth rate returning to its normal historical pattern, the industry has before it a market adequate for prosperity although some self-restraint obviously must be practiced in view of the surplus producing capacity which has been built up at government request to be ready for any possible national emergency.

Princes of serendipity

Someone has said that it cannot be accepted that scientists are naturally equipped with serendipity. But when we think of Newton and the apple falling on his head and farther back in scientific history, a Greek gentleman leaping from his bath exclaiming "Eureka", then can we doubt that the trained, ingrained habit of observation is ever asleep? Röntgen likewise "happened to notice" something that opened the door to a new world of physics. Fleming, too, in our time, "happened to notice" that a rare penicillin mould was a killer of bacilli. Princes of serendipity—kings some would say—they have their conscientious liegemen today.

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Alkylation Unit On Stream

Sunray Oil Corp. has started the production of 1,500 barrels per day of high octane aviation alkylates at its Duncan, Okla. refinery. The alkylates are processed from a charging stock of 1,800 barrels per day of butenes and butylenes manufactured in Sunray's catalytic cracking unit.

Erratum

It was erroneously reported in the October issue of WORLD PETROLEUM that the Alberta provincial government had acted to grant a gas export license to Trans-Canada Pipe Lines. The license has not been granted as yet, although present indications are that some action will be taken in the near future.

The Alberta Petroleum and Natural Gas Conservation Board has not yet made its report on gas reserves and the Province will issue no license until this report is at hand. Currently it is believed that Alberta's exportable surplus is in excess of three trillion cubic feet.

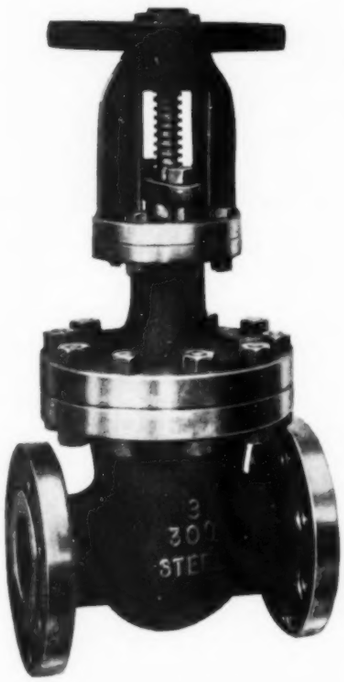
Recently Premier Ernest Manning of Alberta met with Premier Leslie Frost of Ontario and Federal Mines Minister George Prudham to discuss the gas situation caused by the proposal to import United States gas to Toronto. Canadian newspapers reported that the three were in agreement that the eastern Canadian markets should be preserved for Canadian gas if possible.

Charles L. Harding

Charles L. Harding, 47, director and vice president in charge of Middle East affairs of Socony-Vacuum Oil Co., Inc. died September 23 after an illness of several months. He had been a member of the Socony-Vacuum board of directors since 1948.

Immediately after graduation from law school in 1933, Mr. Harding joined the Shell Oil Company, Inc., in San Francisco and was transferred to Shell's New York office in 1937. From January 1942 until September 1944 he served in various capacities with the PAW and returned to Washington as East Coast director for nine months in 1945. After three years in Socony's law department, Mr. Harding was elected a director in 1948 with responsibility for coordinating the company's interests in the Middle East. In January 1953 he was elected a vice president and member of the executive committee.

Valves and Fittings for the Oil and Allied Industries



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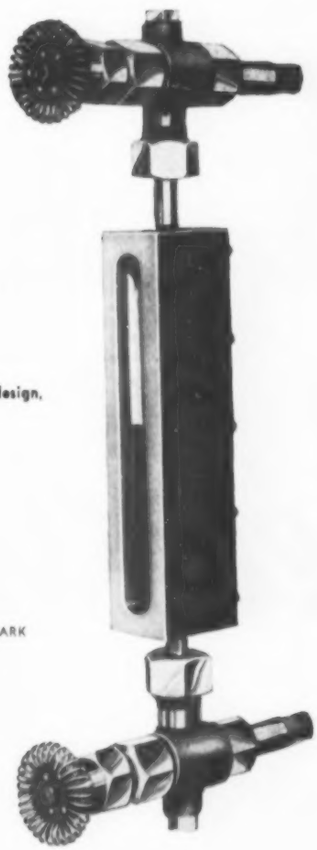

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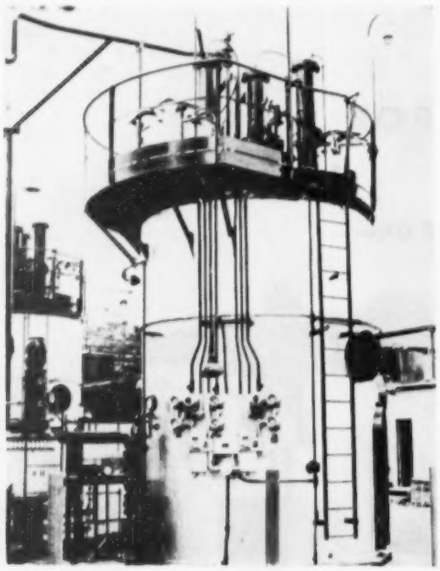
Electric Lube Oil Process

Petreco division of the Petrolite Corporation has announced an electric process for acid-treating lube oil and similar stocks. The process is a continuous, automatically-controlled treating method, designed to replace the conventional batch agitator method for acid treating lube oil stocks. Being automatic and continuous, it replaces manual "art" and "skill" by engineered precision control.

Simplicity features the process. The lube stock to be treated and the treating acid are pumped into the mixing section, then the acid-oil mixture continues on into the Petreco electric treater. From the treater the acid-treated oil goes to the neutralization step, while the sludge is drawn off for disposal or re-use. In commercial use, Petreco lube oil treaters with a volumetric capacity of 90 barrels are processing from 2,500 to 4,000 barrels per day, depending on the type of oil treated.



Petreco electric treater for acid-treating lubes.

Since the electric field causes a very rapid coagulation and settling of the sludge, mixing of the acid and raw lube stock can be more intense than where gravity settling is employed, thereby obtaining better utilization of acid. Where the oil-sludge contact in a conventional agitator may vary from 4 to 12 hours, the contact period in the Petreco process is reduced to an hour, and in some cases less than an hour. The sludge is withdrawn continuously by automatic means which eliminate any appreciable entrainment of lube stock in the sludge.

The electric field reduces the amount of sludge in the treated stock to a lower value than the conventional process and eliminates the necessity for a "water-gathering" operation on the lighter lube oils. Complete information on this new process is available from the Petrolite Corporation, Petreco Division, 1390 E. Burnett Street, Long Beach 6, California, or P. O. Box 2546, Houston 1, Texas.

New Technical Magazine

Worthington Corp., Harrison, N. J., has begun publication of a technical house magazine entitled *Power and Fluids*. It will be published quarterly for readers in the power and fluid handling fields to describe new product applications, processes and methods. The new publication is expected to reach an initial external circulation of 25,000. It will be distributed to Worthington customers and prospective customers, libraries and industrial relations departments of recognized technical institutions including engineering colleges, technical societies and industrial concerns requesting it. Cy Freeman is editor.

Honor Past Presidents

The Tulsa chapter of Nomads honored former heads of the local organization at their first fall meeting at the Southern Hills Country Club on September 18. Past presidents in attendance are shown in the front row, left to right: C. O. Willson, The Oil & Gas Journal; P. E. Fitzgerald, Dowell, Inc.; H. A. Bourne, Republic Steel Corp.; Stanley W. Wilcox, Seismograph Service Corp.; and M. D. Gilbert, Rockwell Mfg. Co. Back row, left to right: K. O. Hoevel, National Supply Co.; Shep Miers, Southwest Supply Co.; G. W. Davidson, W. C. Norris Mfg. Co.; H. M. Cooley, Bethlehem Steel Corp.; Opie Dimmick, Century Geophysical Co.; and C. F. Coons, National Tube Div. U. S. Steel Corp.

Pan Am to Build Hydroformer

A fixed-bed hydroforming unit will be built at the El Dorado refinery of Pan-Am Southern Corp., R. T. Colquette, vice president in charge of manufacturing, has announced. The unit will be one of the first of its kind in the United States and will incorporate new design features as well as a catalyst developed by the research department of Standard Oil Co. of Indiana, Pan-Am's parent company. Units of similar design are also under construction at the Texas City refinery of Pan American Refining Corp. and the Wood River, Ill. refinery of Standard of Indiana.

The Lummus Co., construction engineers for many Pan-Am units at both El Dorado and Destrehan, will build the new hydroformer. Although definite schedules have not yet been established, plans call for completion of the unit sometime next summer.

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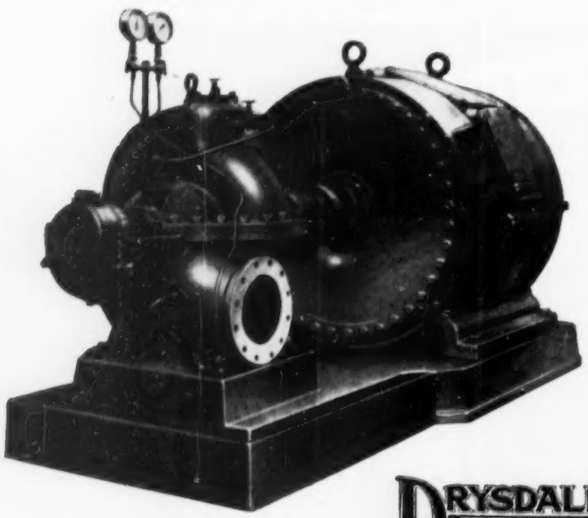

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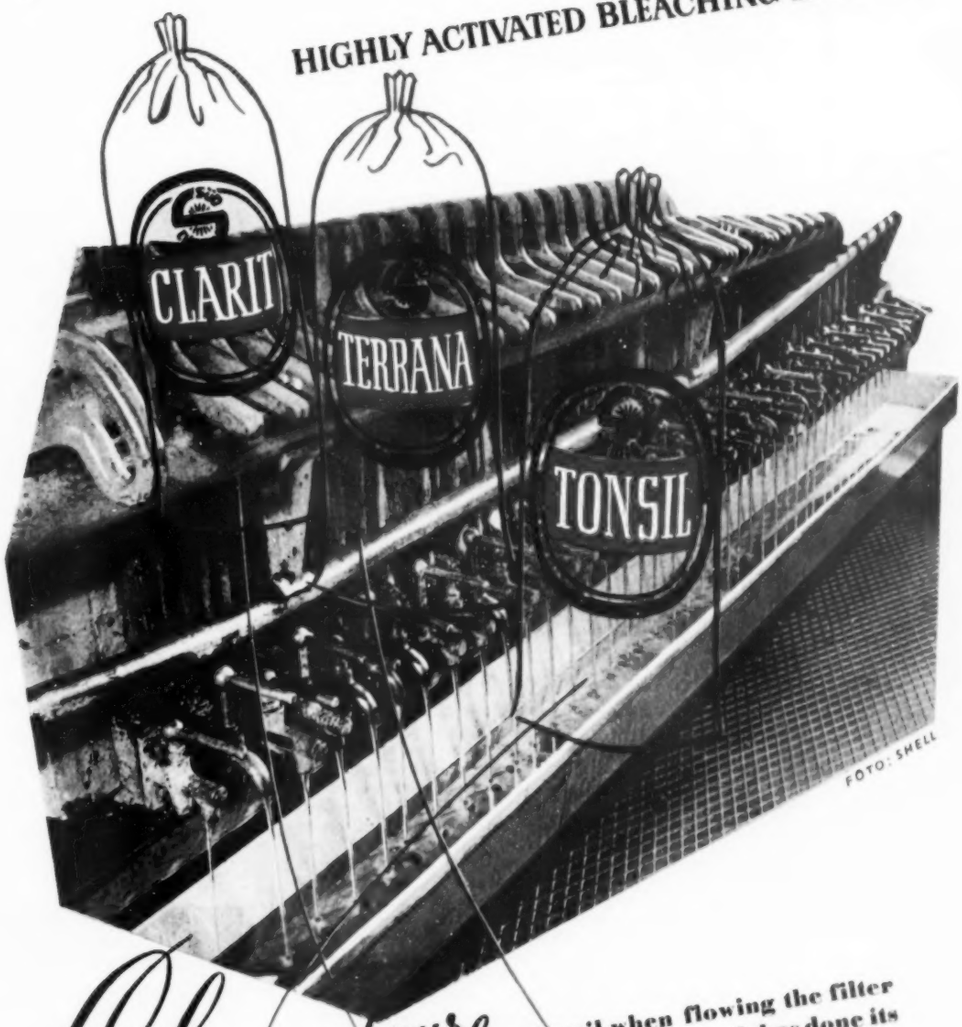

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Hydrogen Processes in Petroleum Refining

(Continued from page 116)

Development Company also had a number of desulfurization patents issued to them. J. McAffee (2,623,006) treats hydrocarbon oil containing sulfur compounds in vapor form with hydrogen in the presence of a metal or metal oxide of the iron group deposited on a porous carrier at 600-950° F. and 100-1,000 psi pressure. After the formation of substantial amounts of carbonaceous material and sulfide on the catalyst, the latter is treated with hydrogen at higher temperature under pressure to convert a substantial amount of the carbonaceous material into hydrocarbon vapors without substantial conversion of the deposited sulfides, whereupon the catalyst is regenerated by combustion of the remaining carbonaceous material. P. W. Cornell (2,614,066) claims a dehydrodesulfurization with subsequent reforming of the reaction gases. Hydrodesulfurization of high boiling petroleum hydrocarbons at 750-950° F. and 100-1,000 psi over iron group metals, their oxides or mixtures thereof, is disclosed by W. A. Horne (2,647,857). The space velocity is reduced as metal sufides are formed to maintain constant conversion. According to Crawford (2,646,388) a supported nickel catalyst for this type of operation is periodically regenerated by burning and then reduced under carefully controlled conditions to avoid excessive heat and catalyst sintering.

A catalyst consisting of specific amounts of chromium, molybdenum, and aluminum oxides is employed by H. M. Stine (2,577,823 to Standard Oil Co. of Ohio) to hydrosulfurize heavy oils containing 1-6.5 percent sulfur as organic sulfur compounds. In Standard Oil Development Company patent 2,636,841, R. B. Mason used an iron group metal carbonyl catalyst with a halogen promoter for hydrodesulfurization of high boiling fractions at 300-900°F. and 500-5,000 psi pressure.

Catalyst Preparation and Activation

While catalyst compositions and treatment are also discussed in other sections of this review, a few recent patents relating to the preparation and activation of hydrogenation-dehydrogenation catalysts will be touched upon.

P. C. White in U.S.P. 2,583,619 (to Standard Oil Co. of Indiana) describes the preparation of a fixed skeleton layer of Raney catalyst. An iron wall in a conversion zone is alloyed to a thickness of 0.015-0.125 inches with 35-65 wt. percent zinc. The alloyed layer is then leached with an aqueous solvent which will dissolve the zinc but not the iron, which in turn is then activated by treatment with hydrogen. A catalyst consisting of approximately 20 wt. percent calcium manganate and 80 wt. per cent alumina is disclosed in Standard Oil Development Company patent 2,648,638 (R. B. Bennett). Dehydrogenation in a fluidized system is carried out by A. F. MacLean (2,634,242 to Celanese Corp. of America) with an alumina containing a mixture of oxides of barium, chromium and copper. The catalyst is attrition-resistant and is activated by air treatment at 600-700° F. for 1-4 hours.

A Phillips Petroleum Company patent (2,601,-624, J. R. Owen and J. W. Myers) deals with the preparation of a pelleted gel catalyst of increased crushing strength, consisting of alumina and at least one of the oxides of chromium, vanadium, or beryllium.

Taylor Starts Second Platformer

Taylor Oil and Gas Co. recently put on stream its second UOP Platformer at Texas City, Texas. The new unit has a design charge capacity of 5,000 b/sd reactor charge. Taylor's other UOP Platformer, a 4,000 b/d unit, went into operation December 10, 1951, at its Port Isabel, Texas refinery.

Joins Cardwell

Lee J. Laird has recently joined the Cardwell Manufacturing Co., Inc., of Wichita, Kansas, as its California representative. He was formerly assistant general sales manager of the Baash-Ross Tool Co. and has been associated with the petroleum industry since 1928.

Ion-Resonance Mass Spectrometer

A new mass spectrometer designed specifically to meet process instrumentation requirements in the gas, petroleum, pharmaceutical, and chemical fields has been announced by the General Electric Company's special products section. The new instrument uses the principle of ion resonance. In addition, a sample inlet system has been designed to allow direct connection to a stream or process line, thus allowing continuous sample introduction.

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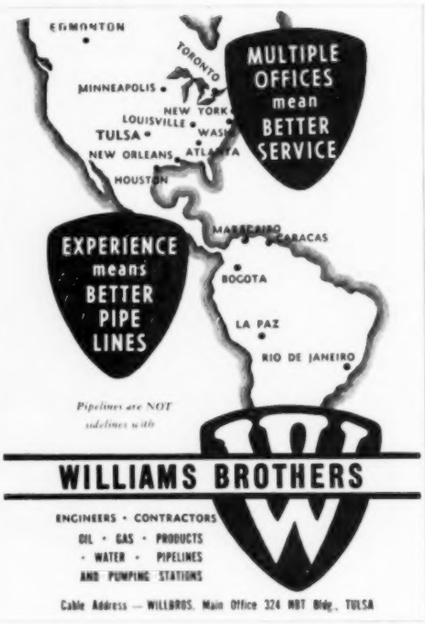

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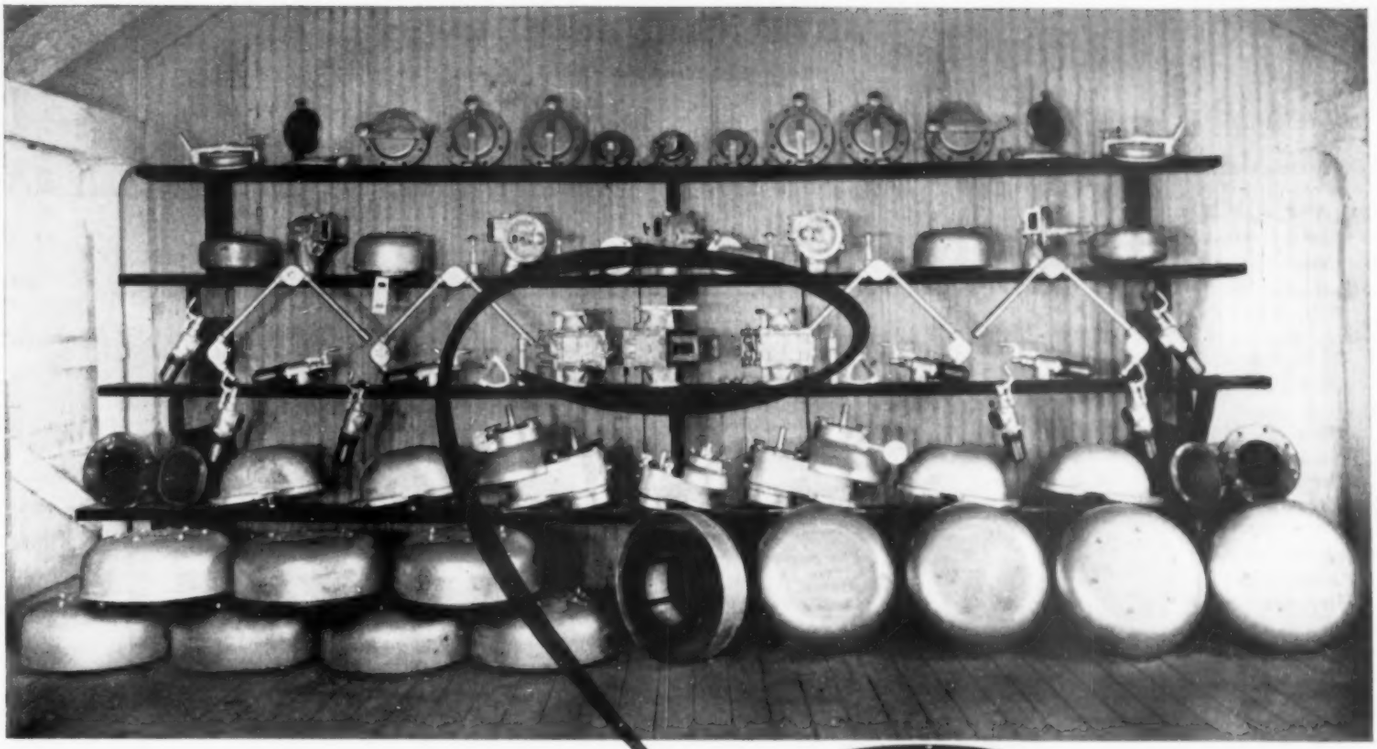

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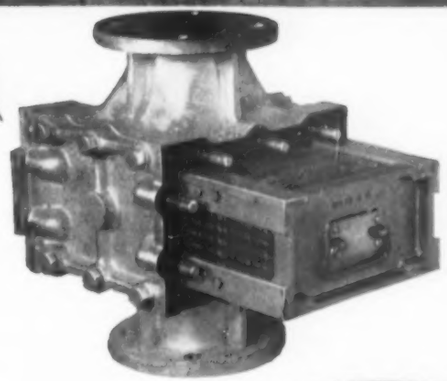

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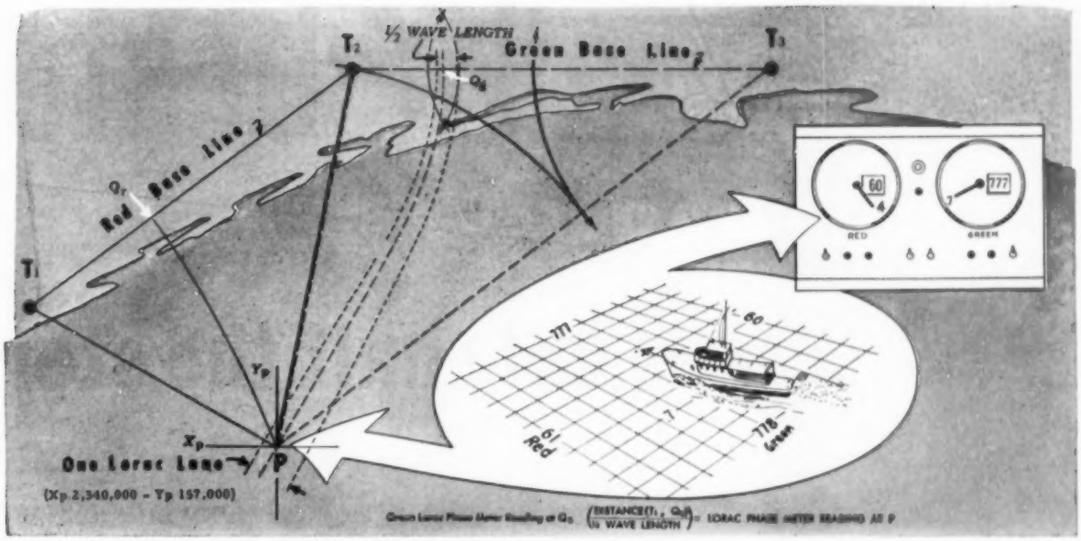

POSITIONING WITH LORAC

The Lorac method of establishing position, because it is a hyperbolic system, requires the conversion of co-ordinates from the hyperbolic to the rectangular or vice-versa.

Generally, the positions to be occupied by geophysical operations are known in X and Y values. Converting them to the corresponding Lorac phasemeter readings can be done in three ways.

1) By the use of a hyperbolic grid overlaying the map.

2) By simple geometric construction, or

3) By mathematical computation.

The first two methods, while convenient, provide only approximate equivalents because of the inaccuracies in map making and in the plotting thereon.

For geophysical operation out in the Gulf of Mexico, pin-point accuracy is assured by the use of computing machines which allow full advantage to be taken of the inherent high precision of the Lorac system of positioning.

LISTING OF BOAT POSITIONS IN LAMBERT COORDINATES

BOAT NUMBER	DATE	RED DIAL READING	GREEN DIAL READING	X_P POSITION IN LAMBERT COORDINATES	Y_P POSITION IN LAMBERT COORDINATES
1 A	MARCH 13 1953	58.87	780.97	2,340,000	162,000
1 B	MARCH 13 1953	59.40	779.88	2,340,000	160,000
1 C	MARCH 13 1953	59.94	778.79	2,340,000	159,000
1 D	MARCH 13 1953	60.47	777.71	2,340,000	157,000
1 E	MARCH 14 1953	64.84	769.06	2,340,000	145,000
1 F	MARCH 14 1953	44.57	816.37	2,340,000	142,500
1 G	MARCH 14 1953	47.39	810.00	2,340,000	139,500

Example of LORAC position computation.

Three networks in operation covering an area from off the Coast of Freeport, Texas, to Caillou Bay, Louisiana.

LORAC
Lorac Service Corporation
A SUBSIDIARY OF SEISMOGRAPH SERVICE CORPORATION
BOX 1590, TULSA, OKLA.

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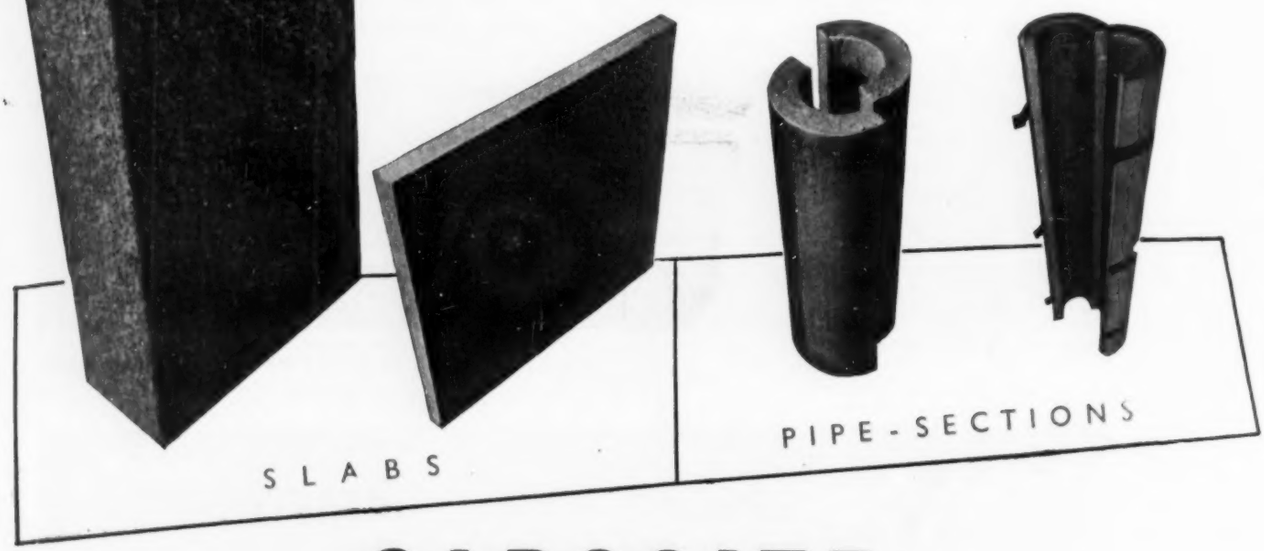
CAPOSITE insulation is not just all-asbestos. It is *all-amosite;* amosite being the uniquely long-fibred asbestos—from the Cape Asbestos Co. Ltd's own mines—which makes possible CAPOSITE'S particularly open, cellular texture. This texture gives it a level of thermal insulation which saves over 98 per cent of uncovered hot surface losses, plus a resistance to the severest conditions of steam heat which enables it to maintain this efficiency almost indefinitely. CAPOSITE pre-formed pipe-sections and slabs are extremely strong, yet light and easy to fit; non-corrosive; and exceptionally economical. Write for full details.



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ATLAS PROCESSING COMPANY at Shreveport, Louisiana, has recently placed in operation this Hudson-Built benzene recovery plant, the first to recover substantial quantities of natural benzene from liquid hydrocarbons extracted from natural gas. Over 98% of the benzene present in motor fuel base stocks produced in gas processing plants in the Carthage gas distillate field of East Texas is extracted in this unit. The benzene is nitration grade, having a purity of over 99.6%. Hudson is proud of its part in implementing the concept of the Atlas management in this pioneering operation.

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